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SUMMARY OF RECENT ABSTRACTS *

IV. TRYPANOSOMIASIS †

African Trypanosomiasis

General: Epidemiology

Reports of several conferences on trypanosomiasis have been published, which include many papers which cannot satisfactorily be abstracted, and which should be read in the originals. The International Committee for Trypanosomiasis Research (p. 1057) held its fifth meeting in 1954. The papers submitted covered a wide range of subjects, which are briefly noted in the review.

A conference on trypanosomiasis was held in Léopoldville in 1954 (p. 875). In a general account of trypanosomiasis in the Belgian Congo Neujean pointed out that the various control measures undertaken—treatment, prophylactic treatment, tsetse control—are steadily extending the area free from sleeping sickness; the "index of circulating virus" has fallen low, but there are still potential dangers in such biological factors as occult infections in healthy carriers. Fairbairn showed that long-continued work has proved that *Trypanosoma rhodesiense* maintained for many passages in animals still remains pathogenic for man on cyclical transmission, and he has no doubt that game animals are a reservoir for the human disease; the same may be true of *T. gambiense*, which also remains pathogenic for man after animal passage. In French West Africa there has been a spectacular and steady decline in sleeping sickness since 1934, but Masseguin and Taillefer-Grimaldi pointed out that although campaigns have been very successful in the savannah

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1955, v. 52. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on trypanosomiasis in this series see the May issues of the *Tropical Diseases Bulletin* each year since 1939.

country, where the people are cooperative, they have been less so in the forest regions where the people are less amenable. There are residual foci throughout the country, and they may be important as centres of recrudescence if precautions are relaxed.

In a special issue of *Médecine Tropicale* (p. 19) devoted to African human trypanosomiasis a historical account is given of the development of the progress of French work. *T. gambiense* infection is regarded as curable and has been deliberately induced as a treatment of mental illness. The question of a developmental cycle, possibly involving leishmania forms such as have been seen in cerebrospinal fluid and in dab preparations of the heart, is discussed without definite conclusions. Treatment and prophylaxis are described, especially with the diamidines, and the whole issue is a well-merited tribute to all French and other workers in Equatorial Africa.

The report of the Tsetse Fly and Trypanosomiasis Committee of the British Colonial Office is reviewed on p. 438. Among much interesting and important work recorded may be mentioned the extensive scheme to make the underpopulated regions of Zaria Province, Northern Nigeria, available for farming.

In a paper describing the work of the West African Institute for Trypanosomiasis Research MULLIGAN (p. 874) gives an account of the development of research on tsetse control, the adaptation of *T. vivax* to laboratory animals, the chemotherapy of human and animal trypanosomiasis, and other matters. In the report of this Institute for 1953 (p. 130) he gives information on development of methods for cultivating *T. gambiense*. Cyclical transmission through *Glossina palpalis* was only occasionally successful. For treatment Melarsen has given a favourable clinical impression, and for prophylaxis pentamidine has been used successfully. As there seems to be a transmission season in Northern Nigeria, pentamidine could best be administered as a routine in February. For tsetse control the method of " obstructive clearing " has been investigated—where a stream carries many creepers and thickets they are encouraged to grow, to obstruct the flight of the tsetse up and down the stream. A note is made that much of the work of this Institute relates to trypanosomiasis of animals. NASH (p. 958) describes the work of this Institute during 1954. Various strains of *T. gambiense* are maintained and an attempt has been made to establish a satisfactory routine cyclical transmission through *G. palpalis*, but this is as yet irregular. Various other major projects of transmission of other trypanosomes were continued, and entomological work was carried out at a field station where 8 species of *Glossina* are available close by.

In Northern Nigeria (p. 341) the sleeping sickness service has been incorporated into the Regional Medical Headquarters. The incidence of the disease is now low, but the relapse rate has increased so that the chronic disease is likely to become a major problem. Fly control continues.

Lotte (p. 1058) describes the work of the mobile health units of French Equatorial Africa and the means by which they are maintained in coastal and riverine areas.

In Portuguese Guinea very large numbers of people were examined during 1953, and treatment was given to the 1,793 persons with newly diagnosed trypanosomiasis. Pinto (p. 1058) gives an account of this work and of the prophylactic and tsetse-control work. The Sleeping Sickness Mission performs much other work also.

Harley and Miller (p. 874) give an account of trypanosomiasis in north-eastern Liberia, as seen at a dispensary where cases constitute 10 per cent. of all out-patients treated.

In Tanganyika the incidence of sleeping sickness rose in 1954, and Apted (p. 752) notes that temporary fishing villages are a source of danger, and expeditions into tsetse-infested woodland in search of honey, beeswax and game. There was a fresh outbreak in the Lake Province.

Transmission

The very complete and masterly monograph, *The Natural History of Tsetse Flies*, by Buxton (p. 853) brings together the vast literature on this complicated subject in an orderly and lucid manner. This book will serve as a standard textbook for many years; it was a chief preoccupation of the author for several years before his untimely death.

Rageau and Adam (p. 1059) describe the distribution of tsetse flies in the French Cameroons.

The anatomy of the tarsi of *G. palpalis* has been studied by Lewis (p. 412) in relation to uptake of contact insecticides.

Work in Portuguese Africa has led Machado (p. 17) to the conclusion that the tsetse fly known as *fuscipes* should be regarded as distinct from *palpalis*, and as a separate species, *G. fuscipes*, with subspecies *fuscipes*, *martinii* and *quanzensis*. Glasgow (p. 132) reports a study of *G. palpalis fuscipes* along the shore of Lake Victoria and the banks of a river; it is not very "available" to man in that area. The mean death rate of non-teneral males was 26 per cent. per week, and the mean length of life therefore 27 days. Along the river it was always more hungry than along the lake shore.

Van den Berghe and Lambrecht (p. 17) have found *G. brevipalpis* in gallery forests along the banks of a river in Urundi—an extension of its known geographical distribution. Trypanosomes were found in the glands of 2 flies, but they were not necessarily polymorphic.

Potts (p. 1059) describes a new species of tsetse fly, *G. nashi*, from the Cameroons.

Harley (p. 341) studied the breeding sites of *G. morsitans* in two parts of Tanganyika, concluding generally that it finds cooler sites for pupae in the hot season, and rather warmer sites in the cool season, but that the temperature control obtained is not precise, but lies within an average range as great as 4°C. *G. swynnertoni* tends to occur in rather

more arid country than *G. morsitans*, yet under identical conditions it does not resist desiccation better than *G. morsitans*. JACKSON (p. 342) found evidence which indicated that *G. swynnertoni* meets the threat of desiccation by taking more frequent blood meals.

The East African Tsetse and Trypanosomiasis Research and Reclamation Organization (p. 959) have issued a booklet, *Notes for Field Studies of Tsetse Flies in East Africa.*

Diagnosis: Clinical Findings

PINTO (p. 1060) successfully cultivated trypanosomes [presumably *T. gambiense*] from the bone-marrow of patients with sleeping sickness in various stages of the disease. This may be a useful procedure when trypanosomes cannot be found in the blood or lymph.

JANSSEN (pp. 342, 877) used the Thorn test in sleeping sickness; it was normal in several patients in the late stage after unsuccessful treatment, and abnormal in others. Interpretation is difficult, but the test gives some information of interest.

RIDET (p. 259) examined vaginal smears from women with trypanosomiasis, and concludes that genital dysfunction, which is common, is of endocrine origin, and is not due to the direct action of the trypanosomes on the genital organs or the products of conception.

In an investigation to determine the changes in the blood in trypanosomiasis and to find if any correlation exists between these changes and the gravity of the illness, PÉTARD and RIDET (p. 258) estimated serum proteins and examined serum by paper electrophoresis, and performed various liver tests. Marked differences occur in blood proteins during the disease but they do not correspond with the severity of the illness. Treatment with Arsobal was successful and no resistant trypanosomes were encountered; the return of the albumin-globulin ratio to a value of 1·0 or over was an indication of the success of treatment.

In sleeping sickness the alkaline phosphatase of the leucocytes is increased (TRINCÃO *et al.*, p. 18).

RADERMECKER (p. 258) used *T. gambiense* in the treatment of a patient with mental disease which had not yielded to other treatments. Electroencephalographic changes were noted within 24 hours of infection, and were independent of changes in the cerebrospinal fluid. Treatment with suramin was successful in curing the infection, and the infection itself was beneficial to the patient.

A study of the relationship between albumin and cells in the cerebrospinal fluid of patients with *T. rhodesiense* infection is reported by DE BASTO (p. 753), who has evolved a formula which permits comparison of cases. This should be read in the original.

Treatment: Chemoprophylaxis

A general account of sleeping sickness in East Africa, and its treatment, has been published by WILLETT (p. 1173). For early cases the

drug of choice is still suramin. Pentamidine is less reliable. Mel B is still on trial, but a combination of suramin and Mel B is promising. Tryparsamide is still used, but carries the risk of optic atrophy, and this drug may be superseded by Mel B. Debeir (p. 1060) has never found a patient becoming blind from trypanosomiasis, but the use of tryparsamide quite often leads to serious lesions of the optic nerve, especially in patients in a late stage of the disease, or suffering from syphilis also. In such cases the treatment should be stopped, and some workers report good results from the use of BAL.

Pinto (p. 18) reports good results from a single injection of Mel B [Arsobal], but, as noted by Maegraith in comment, does not state the species of trypanosome [presumably *T. gambiense*] or give clinical details of the patients. Arsobal is valuable in the treatment of trypanosomiasis which has resisted other drugs, but Michielsen and Triest (p. 343) noted myocardial damage and raised blood pressure in 5 of 6 patients treated with it. It should be used only when other drugs are found ineffective. Silva *et al.* (p. 878) used Arsobal in *T. rhodesiense* infections; in 164 patients the central nervous system was involved and of these 34 had had previous treatment with other drugs. Some 60 of these patients were cured, and it seems that Arsobal is much more effective than tryparsamide in patients with nervous-system involvement; but its toxicity is high, and it caused the death of 11 patients. Arsobal should be given only in hospital, and early cases which usually yield to Antrypol or pentamidine should not be exposed to the risks associated with Arsobal.

Tobie (p. 134) shows that the antibiotic Puromycin is active against several trypanosomes—the least susceptible species were *T. gambiense* and *T. rhodesiense*. Puromycin is very effective against *T. equiperdum*, but its action is diminished when various purine compounds are given at the same time. Hewitt *et al.* (p. 518) think that its action is to interfere with purine metabolism and the synthesis of nucleic acid or nucleoproteins. The same authors (p. 960) found considerable activity against *T. equiperdum* in a large number of analogues of Puromycin. They discuss the mode of action. Trincão *et al.* (p. 615) used Puromycin in the treatment of 15 Africans suffering from *T. gambiense* sleeping sickness. It was given orally in capsules of 250 mgm., the daily dosage being 1 to 2·25 gm., and the course lasting 7 to 10 days. The results were promising, with 2 early and 2 later relapses during a period of 6 months. Toxic manifestations were few.

In a survey of the literature on chemoprophylaxis with the diamidines. Gall (p. 133) concludes that pentamidine, as the diisethionate or the dimethyl sulphonate, is the drug of choice, administered intramuscularly in doses of 3–4 mgm. per kgm. (base) every 6 to 12 months. Toxic effects are mild. Properly conducted campaigns of 2 or more injections can reduce incidence to less than 0·1 per cent., and this kind of prophylaxis has been successful where mass survey and treatment, in the absence of

tsetse control, have been only partly effective. Failure occurs in 0·1 per cent., mostly owing to early infections missed at the preliminary survey.

In part of French West Africa Masseguin *et al.* (p. 1061) gave both Lomidine and Antrypol at the same time for chemoprophylaxis. The doses now advocated are 4 mgm. Lomidine per kgm. intramuscularly, and 0·02 gm. Antrypol per kgm., with a limit of 1 gm., intravenously. [In one place in the original paper the dose of Antrypol is given (evidently in error) as 2 cc. of a 10 per cent. solution per kgm. intramuscularly, but later it is shown as above.]

Control

In Tanganyika Burnett (p. 134) attempted to eradicate *G. morsitans* and *G. swynnertoni* in an area of bush by introducing cattle which were sprayed twice each week with DDT. Great reduction was achieved, but not complete eradication; this was attributed to immigration of flies across the barrier clearing. The experiment was promising.

Hocking and his colleagues (pp. 344–46) made extensive studies on the control of tsetse flies in a block of woodland in East Africa by application of insecticide from aircraft. In a trial with DDT in oil it was found that the reduction of *G. pallidipes* was almost complete, of *G. morsitans* 98 per cent., and of *G. swynnertoni* 94 per cent. The tsetse populations remained low for a long time. The cost was high, largely because the aircraft was expensive. In the rainy season, with the trees in full leaf, and conditions generally unfavourable, BHC was used. *G. morsitans* was reduced 80 per cent., and *G. swynnertoni* 64 per cent. In another, and smaller, block of woodland the use of DDT in the rainy season was more successful against *G. swynnertoni*, which was practically eliminated. The difference between this and earlier experiments was that the number of tsetse flies before the application of the insecticide was very low, and a proportionate reduction may therefore have meant difficulty for the fly in re-establishing itself. In continuation of the same kind of work Yeo (p. 347) estimated the effect of atmospheric conditions on the deposition of coarse aerosols emitted from aircraft.

In part of Northern Rhodesia *G. morsitans* has been completely cleared by felling the trees in the small, narrow, flat-bottomed valleys in the headwaters of the rivers, and along the edge of the surrounding woodland (Glover *et al.*, p. 878); this method is empirical because we do not know why these valleys are essential to the fly. Earlier attempts at control by fire exclusion were only partly successful.

Trypanosomiasis of Animals

An account of the distribution in French West Africa of infections of domestic stock with animal trypanosomes is given by Mornet (p. 614).

A series of papers have been published by Peel and Chardome

(pp. 135–36) on *G. brevipalpis* and the experimental transmission of animal trypanosomes by it.

Squire (p. 439) has published observations on the incidence of trypanosomes (*T. vivax*, *T. congolense*) in *G. palpalis*. Desowitz and Fairbairn (p. 1061) show that the incubation period of *T. vivax* in *G. palpalis* is much shorter (9 days) when the flies are kept at 29°C. than at 22°C. (12–13 days).

Experimental work by Werner (p. 879) with various trypanosomes in pregnant mice, rats, hamsters and guineapigs showed that maternal antibodies do not pass through the placenta, and that the infection is not transmitted through the milk. There is no evidence that the absence of infection in the offspring is due to antibodies in the mother's milk.

American Trypanosomiasis

Chagas's Disease

Epidemiology: Transmission: Aetiology

In Argentina the vector is *Triatoma infestans*, and Romaña (p. 960) calculates that of 3,500,000 inhabitants of parts of Argentina infested by these bugs, there are at least 700,000 human carriers of *T. cruzi*.

Observations by Geigy *et al.* (p. 21) indicate that folic acid is an important product of the symbiotic micro-organisms in the intestine of *Triatoma infestans*, and that it is probably indispensable to the bug.

Chagas's disease may be transmitted in the course of blood transfusion. Nussenzveig *et al.* (p. 22) tried various substances in an effort to sterilize blood infected with *T. cruzi*, finding that gentian violet at a concentration of 1 in 4,000 was the most satisfactory. It kills the trypanosomes in 24 hours and does not produce haemolysis or give any toxic effect. They recommend treatment of blood of suspected donors in this way.

In South America the opossum is regarded as one of the reservoirs of *T. cruzi*; Angel Espinoza (p. 519) examined infected opossums but failed to find evidence of a tissue stage of *T. cruzi*. He believes that development is restricted to the blood stream, but in comment Hoare remarks that if this is so, our conception of the life cycle needs modification.

Although it has usually been thought that after infecting the mammalian host the metacyclic forms of *T. cruzi* undergo development in subcutaneous elements of the reticulo-endothelial system before invading the blood stream, Grignaschi (p. 880) has shown that they may invade the blood stream directly.

Pizzi and Prager (p. 618) have stabilized a strain (T) of *T. cruzi* so that it behaves in a uniform manner in mice. Parasitaemia remains low for 4–6 days, then rises abruptly, and the mice die in 9–12 days after

infection. The trypanosomes develop in histiocytes and fixed macrophages of the connective tissue, whereas muscles are only slightly affected. In 4–6 days the leishmania forms are transformed into slender trypanosomes, which invade the blood.

Manso Soto and Prosen (p. 616) discuss the generic name of *T. cruzi*, and agree with Hoare that it should be retained in the genus *Trypanosoma*, not *Schizotrypanum*. They (p. 616) discuss the kinetoplast.

De Freitas and Hausmann (p. 1175) describe a new medium, of blood treated with pepsin, for the cultivation of *T. cruzi*.

Rubio and Pizzi (p. 440) report that primaquine, pentaquine, and pentaquine with quinine have a lytic action *in vitro* on blood stages of *T. cruzi*. Quinine produces rapid gelification of plasma of infected animals, and this may be a diagnostic point.

Pathology: Clinical Findings

Experiments on immunity in *T. cruzi* infections have been made by Pizzi *et al.* (pp. 347, 618), who show that in a strain of mice a virulent strain of *T. cruzi* multiplied in fibroblasts, fixed macrophages and muscle fibres, and provoked an inflammatory reaction at the site of inoculation. Antibodies could not be detected. In a strain of resistant rats the infection proceeded by crises, with phagocytosis in the inflammatory nodules and an increase in antibody titre, after which it became chronic. Immunization with attenuated cultures produced a much higher degree of protection than inoculation of virulent trypanosomes together with primaquine (which was tried).

Humoral factors are important in the defence mechanism of experimental *T. cruzi* infection, and Knierim (p. 348) shows that agglutinins present in normal rats increase in titre in the acute phase, diminishing as it becomes chronic; precipitin and complement-fixation tests remain at high titre into the chronic stage. In guineapigs the response was slighter, and in mice no antibodies could be detected. López Fernández and Franca Rodríguez (p. 617) observe that when blood of a mouse containing *T. cruzi* is mixed with inactivated serum of patients with Chagas's disease the adhesion phenomenon occurs, and trypanosomes are quickly transformed into leishmania forms. Adhesion of trypanosomes to the erythrocytes or other particles, and to the glass, may be due to two antibodies, one somatic and the other flagellar. These reactions may be useful for diagnosis.

Pifano (pp. 880, 1062), as a result of extensive investigations in experimental animals and human patients, concluded that of all the diagnostic methods employed for the detection of chronic Chagas's disease (examination of thick blood film, xenodiagnosis, blood culture, inoculation of susceptible animals) xenodiagnosis is the most reliable.

Nussenzveig and Sonntag (p. 21) show that a method of xenodiagnosis in which triatomids are allowed to feed through membrane on blood taken from the suspected person, is more effective than the usual method of

xenodiagnosis. In part of Argentina Sanjurjo *et al.* (p. 960), using xenodiagnostic methods, found *T. cruzi* in 10·5 per cent. of 275 apparently healthy children and adolescents.

Dalma (p. 961) found positive complement-fixation reactions in the cerebrospinal fluid in 4 of 12 persons with Chagas's disease but without neurological manifestations.

Embolic cerebro-vascular incidents in chronic heart disease associated with Chagas's disease are reported by Nussenzveig *et al.* (p. 519).

Control

In an experiment with specially constructed mud and thatch houses, Perlowagora-Szumlewicz (p. 22) found that after spray with BHC (0·5–0·8 gm. of the gamma isomer per sq. metre) the mortality of adult *Triatoma infestans* and older nymphs was higher in summer (97·5 per cent. after 1 month) than in winter (85·8 per cent. after 2 months), but that this difference was due to higher natural mortality of the bugs in summer. The effect due to insecticide was an increase of about 25 per cent. deaths after 1 month, in each. De Bustamante and Gusmão (p. 23) used BHC (suspensions of wettable powder) in houses, spraying once, or 3 times at intervals of 6 months, or 3 times at intervals of 4 months. The dosage was 1 gm. of gamma isomer per sq. metre. This was highly effective in killing *T. infestans*, but in comment Busvine remarks that although pyrethrum was used before and after treatment, to drive the bugs from their crevices, its insecticidal effect does not seem to have been taken into account.

DDT is not very effective against Reduviid bugs, and BHC has not given equal results in different areas. Peñalver and Villagran (p. 1062) therefore tried dieldrin wettable powder (50 per cent. active principle) at a dose of 1 gm. or 2 gm. per square metre in heavily infested houses in Guatemala. In 2–5 days complete eradication was achieved, which was maintained for at least 4 months.

Infection with *T. rangeli*

Trypanosoma rangeli is widespread in Venezuela, where Pifano (p. 881) has found it in dogs and opossums, and in a large number of human subjects. It is transmitted by Reduviid bugs and is quite often found in association with *T. cruzi*. Floch and Fauran (p. 881) describe mammalian trypanosomes found in French Guiana, and Zeledón (p. 882) discusses the nomenclature of these trypanosomes, and describes his own work on *T. rangeli*.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

VAUCEL, Marcel, ROUBAUD, E. & GALLIARD, H. Terminologie du paludisme. [**Terminology of Malaria**] Rapport d'un Comité de Rédaction nommé par l'Organisation Mondiale de la Santé. *World Health Organization Monograph Series No. 25.* 95 pp., 2 figs. 1954. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [10s.; $1.50; Sw.fr. 6.–.]

The original treatise on terminology fostered by the Malaria Committee of the League of Nations (*Bull. Health Organization League of Nations*, 1940, v. 9, 131) was prepared in French and English editions, the English having been recently revised [this *Bulletin*, 1953, v. 50, 996]. The French edition is now revised by a distinguished Committee which has, so far as it has found it possible, followed the lines of the English version. The translation is a scholarly one and for a very large part direct, with the result that the two terminologies are kept in line. The authors have not, however, regarded their task just as one of translation but as one of revision of French terminology with due regard to the convenience of its alignment with English. They have in consequence deviated from the English version in a number of places and in all to the advantage of clear and logical expression. The major differences lie in the sections dealing with pre-erythrocytic forms, immunity, and therapeutics; in the first the difference is largely one of presentation rather than terminology, the authors giving the description of the human pre-erythrocytic forms much more tentatively than is the case in the English edition, and reserving their judgment on whether exo-erythrocytic forms develop in the liver cells or the reticulo-endothelial system. The term immunity covers all natural protection processes; when independent of past or present infection it is classified as innate resistance, when dependent on a continuing infection as premunition, and when independent of such infection, as true immunity. The tortuous definition of tolerance in the English edition is dropped and a simpler one is substituted describing it as a state of immunity (premunition or true immunity) met in holo-endemic areas and apparently acquired but earlier and more effectively than elsewhere, perhaps as a result of congenital immunity.

The section on terms describing the use of drugs is logical and clear. The word chemoprophylaxis covers all preventive usage though, if desired, action on the erythrocytic stage (" suppression " in English) may be called clinical prophylaxis and on pre-erythrocytic stages (" prophylaxis " in English) may be called aetiological prophylaxis. The English expression " suppressive cure " also disappears.

There are a number of other variations throughout the text. The

section on epidemics is simplified and rationalized by giving the word epidemic a generic character applicable to all exacerbations, to be qualified according to their nature rather than sub-divided into outbreaks and epidemics. The expression gamogonic index, meaning the percentage of infected persons showing gametocytes, is in standard use and has no English equivalent. The plasmodimetric and gametometric indices describe the relevant rates multiplied by the average density and have no English equivalents. Curiously, even the gametocyte rate does not occur in the English edition. The fusion of recrudescence, recurrence and relapse into one term relapse is maintained, but it is suggested that in *P. falciparum* infections, where they necessarily arise from the erythrocytic cycle, they might be called revivals of schizogony.

The presentation of the text and the glossary follow very much the English form except that in the French edition the English equivalent is given when possible, whereas French equivalents were dropped in the English version. This undoubtedly adds to the value of the glossary, enabling the reader to notice distinctions as well as similarities of meaning. The French Committee is to be congratulated on an able work which is parallel to but far from a slavish copy of the English.

G. Macdonald

Colbourne, M. J. & Wright, F. N. **Malaria in the Gold Coast (Parts I & II).** *West African Med. J.* 1955, Mar. & Dec., v. 4 (n.s.), Nos. 1 & 4, 3–17; 161–74, 2 maps & 3 figs. [20 refs.]

The authors record the results of systematic malaria surveys carried out in 4 areas of the Gold Coast: Central and Suburban Accra, representative of moderate and high endemicities in the coastal plain; Bomfa, a typical forest village in the cocoa growing area; and Yorugu, a typical village in the northern savannah area. In each of these they systematically record data on the vector, its breeding habits, sporozoite rate and average room density; the parasite species together with the parasite rate and density, the infant parasite rate and the gametocyte rate, and the spleen rate together with the average enlarged spleen. From these they deduce apparent inoculation rates derived from mosquito densities and sporozoite rates, and also apparently successful inoculation rates derived from the infant parasite rates.

They conclude with a critical analysis of their findings, discussions on the validity of present techniques for measuring endemicity, on the mortality and morbidity attributable to malaria, and on some of the problems of control. Throughout the areas *Anopheles gambiae* is the main vector ably assisted by *A. funestus* in the forest zone and to a less extent in the northern savannah. *A. melas*, *A. nili*, *A. rufipes* and *A. rufipes ingrami* are also recorded. *Plasmodium falciparum* is throughout the predominant parasite, *P. malariae* and *P. ovale* take secondary places, while *P. vivax* is not recorded.

The results of the prolonged surveys are recorded in numerous tables arranged to make comparison between areas simple. In the central part of Accra the rarity of anophelines on which to make entomological assessment of the inoculation rate, and the difficulty in a parasitological assessment due to infections acquired elsewhere, make precision impossible, but with this reservation the findings may be summarized as follows: in central Accra bites by infected anophelines are very rare while elsewhere they are common. In central and suburban Accra, Bomfa and Yorugu the annual number of inoculations per person appears to be 0·1, 21, 24 and 28 [the true figure for central Accra is probably somewhat higher, though of the same order]. This enormous difference in exposure to risk is not adequately reflected in normal malariometric data. The maximum parasite rates recorded in the 4 areas are: 47, 89, 92 and 100 per cent., the maximum spleen rates: 35, 77, 80 and 79 per cent., and the successful annual inoculation rates as derived from infant studies are: 0·15–0·4, 0·73–1·8, 1·8 and 3·3. It is clear that in central Accra the apparent inoculation rate derived from mosquito studies is roughly matched by a successful inoculation rate measured on infants of the same order, whereas elsewhere a very high proportion of inoculations do not result in the infection of children, and this can only be attributed to immunity.

The authors discuss the choice of yardsticks for the measurement of endemicity and conclude that none alone is valid and all methods of investigation available should be employed. Their review of mortality and morbidity is derived partly from local data and partly from information collected elsewhere, and they conclude that in the Gold Coast the first attacks of malaria are fatal to about 5 per cent. of children, and cause considerable disability to many; with increasing age the effects of repeated infections diminish until, in adult life, little proven damage is caused. The initial effect of partial control in the more highly endemic areas could only be to reduce endemicity to the state seen in central Accra, which is little better than the original. To be beneficial, control should be pushed past this point to complete stoppage of transmission if real advantage is to be gained.

[This is a useful contribution to general epidemiology as well as that of the Gold Coast. Probably the most informative single measure of incidence is the inoculation rate derived from mosquito density and sporozoite rates. Studies such as this are now clarifying its relation to other indices.] *G. Macdonald*

Shute, P. G. **The Discovery of the Third Cycle in the Life History of the Human Malaria Parasite.** Reprinted from *King's College Hosp. Gaz.* 1955, v. 34, No. 4, 234–42. [31 refs.]

A historical summary is given of the discovery of the main features of the life cycle of the malaria parasite, work in which the author himself

played no small part. It is thus enlivened with a number of personal anecdotes relating to these discoveries, some of which have not been recorded before. It is interesting to note that this research falls into two periods of 20 years each: the earlier, beginning in the year 1880, was devoted to studies on the development of the parasite in the blood and in the mosquito; the later, beginning in 1934 to the third cycle (exo-erythrocytic) of the parasite, with a gap of over 30 years in between.

P. C. C. Garnham

Gelfand, H. M. *Anopheles gambiae* **Giles and** *Anopheles melas* **Theobald in a Coastal Area of Liberia, West Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 508–27, 4 figs. [27 refs.]

" (1) The bionomics of *Anopheles melas* and *Anopheles gambiae* were studied in Marshall Territory, a rural, coastal district of Liberia, West Africa, from January, 1952, through July, 1953.

" (2) The *A. melas-A. gambiae* complex constitutes the most abundant group of mosquitoes in this area, as well as being the main vectors of malaria and bancroftian filariasis.

" (3) *A. melas* and *A. gambiae* are distinct though closely related species, separable by well marked and constant characters in the egg and larval stages. Adults cannot be identified directly.

" (4) The over-all infection rate for malaria (salivary gland dissections) was 5·7 per cent. in *A. gambiae* and 1·4 per cent. in *A. melas*; for filariasis it was 19·5 per cent. in *A. gambiae* and 27·1 per cent. in *A. melas*.

" (5) There was a marked seasonal periodicity in both species in Marshall Territory, *A. melas* being most abundant in the late dry season and early rains (January–June), and *A. gambiae* being most abundant during the rains (June–November). The seasonal incidence is a local characteristic and will probably vary from place to place in Liberia.

" (6) *A. melas* was restricted to coastal districts. It probably does not occur inland beyond two miles from brackish water, and, in Marshall Territory, was not common beyond three–four miles from the mouth of the Du River, although it occurred in small numbers at least 10 miles upriver.

" (7) Both species fed readily outdoors but entered human habitations without hesitation. Feeding occurred at all hours of the night, from dusk to dawn. *A. melas* was shown to be markedly anthropophilic.

" (8) Window exit trap studies showed that 90 per cent. of the *A. melas* females feeding in a hut during the night left for outdoor resting places by dawn, the majority at dawn. Of those remaining, 90–95 per cent. left at dusk later the same day. For *A. gambiae*, the figures were 40 per cent. and 85 per cent. Few females of either species spent the entire gonotrophic cycle indoors.

" (9) Outdoor resting places could not be located in Marshall Territory. In Monrovia, freshly-fed and gravid *A. melas* females were found abundantly on the buttressed trunks of kapok trees and in old termite hills.

" (10) Routine adult collections of *A. melas* showed a marked correlation of peaks in the adult population with tidal fluctuations, population peaks occurring about 11 days after each " spring " tide in the dry season. With the onset of the rains, the effect of the tides was reinforced. During the height of the rains, the river rose, tidal influence vanished, and the population of *A. melas* declined.

" (11) The larvae of *A. melas* breed almost exclusively in brackish water, conditions being optimal in the zone of salt-marsh grass which is flooded only by the bi-monthly spring tides. The larvae of *A. gambiae* breed exclusively in fresh-water—small, open, sunlit pools forming the most suitable places.

" (12) A comparison of adult collecting techniques showed that night-bait collections, human-baited hut traps, and morning collections in huts are all valid sampling methods for following the seasonal variations in incidence of the *A. melas-A. gambiae* complex."

Fox, Jean W. & Fox, R. M. **Maxillary Index and Biological Races in *Anopheles gambiae* Giles.** *Mosquito News.* 1955, Dec., v. 15, No. 4, 207–14, 4 figs. [12 refs.]

In Liberia, the maxillary index was determined for *Anopheles gambiae* females taken in and near human habitations, on human bait beside a permanent swamp, and from a laboratory colony. The mean index for the total of 621 mosquitoes was 14·6 with a range of 11 to 19·5. The means for the 3 different groups were 14·6, 14·6 and 14·8 (lab. colony). The implications by others [this *Bulletin*, 1952, v. 49, 226; 1953, v. 50, 360] that paucidentate and multidentate races of *A. gambiae* exist are disputed. The authors consider that *A. gambiae* is a widely distributed, adaptable insect which deposits eggs in the first available water and, although preferring man if present, feeds readily on other hosts. [See also Gillies, this *Bulletin*, 1955, v. 52, 5.] *D. S. Bertram*

Sen, P. **Ecology of Anopheline Mosquitoes.** *Indian Med. Gaz.* 1955, Jan., v. 90, No. 1, 34–46, 1 fig. [Numerous refs.]

This is a review of the literature, including work by the author in the press, on the biology of anopheline mosquitoes of Bengal. It is not arranged by species but in a series of sections on different aspects of mosquito behaviour, and biology and relevant facts for several species are brought together in the appropriate sections. The figure is an elevation from coast to inland hills showing the zonation of species in relation to topography. *D. S. Bertram*

Stahler, N. & Terzian, L. A. **Studies in the Laboratory Mating Habits of *Anopheles quadrimaculatus* Say.** *J. Exp. Zool.* 1953, v. 124, No. 2, 317–28, 1 graph.

Coda, D., Pontes, J. F. & Coda, M. de M. Maláría por transfusão de sangue. [**Malaria through Blood Transfusion**] *Folia Clin. et Biol.* S. Paulo. 1954, July–Aug., v. 22, Nos. 1/2, 105–12. [10 refs.] English summary.

This paper reports the occurrence of 38 cases of malaria among persons who had received blood transfusions while in hospital in Santos, in São Paulo, Brazil. All these patients came either from Santos itself or from neighbouring towns, all of which are free from endemic malaria. There was no history of previous malaria in any case. Of the 38 infections 33 were due to *P. vivax*, 1 *P. falciparum* and 4 *P. malariae*. During the relevant period a total of 725 patients had received transfusions from the blood bank. Donors to the blood bank are all questioned as to previous attacks of malaria and a microscopic examination of the blood is always carried out. Despite these precautions infections occurred. It would appear that accepted views as to the duration of some forms of malaria infection may have to be revised. Further studies on the exo-erythrocytic forms of *P. falciparum* and *P. vivax* are called for. *Norman White*

Knüttgen, H. J. Diagnostische Schwierigkeiten bei Malariadurchbrüchen unter Chloroquineschutz bei Nichtimmunen in Liberia. [**Diagnostic Difficulties in Malaria "Break-Through" during Suppressive Chemotherapy with Chloroquine in Non-Immunes in Liberia**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1954, Nov., v. 5, No. 4, 445–51.

The author discusses clinical and parasitological findings in "break-through" cases among a group of non-Africans in Monrovia (white and coloured Americans, Europeans, Indians and Lebanese). The subjects had been in Liberia over periods ranging from a few weeks to 5 years and were taking 4-aminoquinolines (chloroquine 300 mgm. base; nivaquine 400–500 mgm. base, once weekly). Dosage was regular in some cases, irregular in others.

Parasites were observed in thick blood films 67 times in an unstated number of these persons over a period of 12 months in an area in which malaria (83·8 per cent. *P. falciparum*) was hyperendemic.

The clinical picture (presumably observed in those subjects in whom the parasites were found) was uniformly mild. The onset was insidious. The temperature seldom exceeded 39°C., rigors were very uncommon. The spleen was sometimes palpable. Most patients were ambulant and

the " attack " did not interfere with their working. Symptoms were often very vague—loss of concentration, headache, backache, eyeache, weariness, sudden sweats, epigastric discomfort. In those in whom parasites were found treatment had an immediate and profound effect.

The search for parasites in thick blood films was made much easier once the author realized what he was looking for, since parasite forms were unusual in subjects taking the suppressive drugs. Parasite density was low—each film was searched for 30 minutes—and diminutive ring-forms developed which were easily missed.

In view of the good results of treatment in such cases, the author recommends a more careful study of the clinical and parasitological features of malaria occurring during suppressive chemotherapy.

[This paper is diffuse and not altogether convincing. Nevertheless, the clinical picture of the " break-through " is familiar enough and it may well be that more careful blood examination in some cases would be rewarded.] *B. G. Maegraith*

Gairdner D. & Shute, P. G. **Nephrosis treated by Malaria. Results in 65 Cases.** *Lancet.* 1955, Nov. 5, 946–50, 2 figs. [13 refs.]

Sixty-five nephrotic patients were given therapeutic malaria: 51 had " pure nephrosis " (gross oedema, proteinuria, hypoalbuminaemia, hypercholesterolaemia, but no hypertension or sustained azotaemia): 14 had nephrosis plus more or less evidence of nephritis.

Results are summarized in the table:—

Results of Malaria Treatment in 65 Cases of Nephrosis

Result	" Pure nephrosis " (51 cases)	Nephritic nephrosis (14 cases)
Complete remission	14	—
Partial remission	11	5
No remission	26	9

A complete remission was defined as loss of all oedema for at least 3 months. Partial remission was defined as substantial but incomplete loss of oedema for less than three months.

Of those with pure nephrosis 14 had complete remissions; 12 of these have remained well over periods of up to 6 years.

No lengthy remission occurred in the patients with nephritic nephrosis.

Age, sex and the duration of nephrosis had no obvious influence on the results of malarial therapy, nor did the prior response or otherwise to cortisone or corticotrophin. The height of the malarial fevers and the length of active malarial infection did not affect the result.

The pattern of remission in successful cases was very similar to that with other agents. Diuresis usually began a day or two after pyrexia had been stopped. Proteinuria began sharply, diminishing at the same time. Plasma cholesterol fell to normal in about 2 weeks, *i.e.* rather faster than in remissions induced by other means. This was probably due to the known action of malaria in depressing plasma cholesterol. There was a rise of γ-globulin, which was initially depressed, and a rise in serum albumin, which began only after the onset of diuresis. High α_2-globulin figures tended to persist long after apparent remission.

Pathological effects of the malaria itself were minimal, except in one patient who received *P. vivax*, and later *P. malariae*, and in which the parasite may have contributed to death. [The reviewer would not agree.]

Anaemia developed in most cases; in 6 it was severe enough to require blood transfusion. Malaria was "terminated" at will with quinine, mepacrine or proguanil.

The authors conclude:—"Nephrosis is a long and disabling illness, carrying still a considerable mortality. While its aetiology remains obscure, only empirical treatments exist. Among these malaria has a place, since long-lasting remissions can be induced in about 1 in 4 patients with 'pure nephrosis', sometimes after hormone treatment has failed."

[Except in the few case histories quoted, no details of malaria therapy are given; the species of parasite and the strain used are not clearly stated, nor is the method of infection. The reviewer concludes that most patients received *P. vivax*. Details of treatment of malaria are not given except in quoted cases, in one of which the mosquito-induced *P. vivax* including a relapse was treated with proguanil only. Is treatment with an 8-aminoquinoline regarded as undesirable in this form of malaria therapy? Would it not be better in general to use blood inoculation only, and in view of the known nephrotic effects of *P. malariae* in children would it not be advisable to avoid this parasite?] *B. G. Maegraith*

Edeson, J. F. B. & Wilson, T. **Treatment of Acute Malaria with a Synthetic Alkaloid of the Quinazolone Series (1698L).** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 543–7.

Extracts from the plant Ch'ang Shan have been used in China for centuries as a remedy for fevers. During the last 10 years alkaloids from this and related plants have been tested for antimalarial activity. Some antimalarial activity has been found but vomiting has frequently been induced. One of the alkaloids, febrifugine, belonging to the quinazolone series, has been prepared synthetically and Hewitt *et al.* [this *Bulletin*, 1953, v. 50, 91] tested 54 compounds of this series against *P. lophurae* in ducks and found most to be active. Compound 1698L of this series was tested by the authors against *P. falciparum* and *P. vivax*

in Malaya. In the doses given [1 to 4 mgm. daily for 5 to 7 days] it proved useless in the treatment of *P. falciparum* malaria and although it appeared to terminate the acute attack in 4 out of 6 cases of *P. vivax* malaria [dosage, 2 to 4 mgm. daily for 4 to 7 days] its pronounced emetic action is a contraindication to its use. While of theoretical interest the drug is clearly much inferior to other antimalarial drugs in current use.

Frederick J. Wright

Lecomte, J. Libération d'histamine par certains dérivés d'acridine. [**Liberation of Histamine by Certain Acridine Derivatives**] *C.R. Soc. Biol.* 1955, May, v. 149, Nos. 9/10, 1060–62.

The following is a translation of the author's summary:—

Trypaflavin, mepacrine and Rivanol injected into the hindquarters of rats provoke the liberation of endogenous histamine.

H. J. O'D. Burke-Gaffney

Lecomte, J. Pouvoir histamino-libérateur de la chloroquine. [**Histamine-Liberating Power of Chloroquine**] *C.R. Soc. Biol.* 1955, Aug.–Sept., v. 149, Nos. 15/16 & 17/18, 1693–5.

The following is a translation of the author's summary:—

Chloroquine provokes a definite liberation of histamine from the tissues of the rat. This power of liberating histamine was not seen in the cat, and was only slight in man and in the rabbit.

H. J. O'D. Burke-Gaffney

Alicata, J. E. & Dajani, S. W. **Observation of Pyrimethamine (Daraprim) as a Suppressant of Malaria in a Small Village in Jordan.** *Amer. J. Trop. Med. & Hyg.* 1955, Nov., v. 4, No. 6, 1006–8.

The authors studied the efficacy of pyrimethamine as a suppressant of malaria in Safut, a village of about 300 inhabitants in Jordan situated 10 miles north of Amman at an altitude of some 2,800 feet. Malaria is endemic in the village and larvae of *Anopheles sergenti*, *A. superpictus*, *A. claviger* and *A. marteri* were found in streams and springs: adult mosquitoes in stables and houses proved to be *A. superpictus*. The study was made during a period of 4 months (June to October) which corresponds to the malaria season and also to the harvest time during which most of the villagers slept out of doors in open tents.

Of 250 villagers from whom blood films were taken 28 (12 per cent.) harboured malaria parasites (*P. vivax*): 90 of the 250 were children aged 2 to 9 years. The treatment study included 230 persons whose ages varied from less than 2 to over 15 years. Pyrimethamine or a placebo was given to unselected persons. The drug was given to 110 persons and

the placebo to 120: the initial parasite rates in the 2 groups were 12·7 and 11·6 per cent. The dose of pyrimethamine was 12·5 mgm. for children under 15 years and 25 mgm. for those over 15. It was repeated on the same day each week throughout the 18-week study period.

Six weeks after the beginning of treatment none of those who received pyrimethamine showed malaria parasites and their blood films remained negative at tests made every 6 weeks until the end of the study. Among the controls who had the placebo 25 who had been negative originally developed *P. vivax* infections. It could not be determined whether these were relapses or new infections. All those who developed malaria during the study were treated with chloroquine and were negative at the end of the study. *H. J. O'D. Burke-Gaffney*

Livadas, G. **The Effectiveness of Residual Insecticides on Malaria Vectors in Greece. (Experimental Tests and Epidemiological Observations.)** *Riv. di Parassit.* Rome. 1955, July, v. 16, No. 3, 169–82, 3 figs. [11 refs.]

The acquisition of resistance to DDT by *Anopheles sacharovi* and the local recrudescence of malaria led to the re-institution of general preventive house spraying throughout Greece, except for the island of Crete, in 1954, with chlordane, Gammexane, lindane or dieldrin. Tests were made to examine the efficacy of some insecticides for the purpose. Experimental stables were sprayed respectively with chlordane at 1·5 gm. per sq.m., dieldrin at 0·4 gm. per sq.m. and a mixture of Diazinon 0·32 and dieldrin 0·25 gm. per sq.m. Subsequent mosquito catches showed that initially anopheline density dropped to about a quarter of its previous value. In the stable treated with chlordane it returned in 10 days to its original level, while the reduction was maintained in the other two stables for 15 days and then decreased, the advantage being with the dieldrin/Diazinon mixture. It is concluded that the latter would be the most appropriate insecticide to combat an epidemic uncontrollable by other means, one or two sprayings being given with a short interval between them in the hope of cutting it short. A number of detailed and carefully controlled anopheline counts were also made in villages which had received routine application of insecticide. Catches in sprayed and unsprayed dwellings are recorded and they show fully maintained densities after the recent application of DDT and BHC and reduced but still significant densities after the recent application of chlordane.

It is concluded that the resistance of *A. sacharovi* to DDT has extended to other chlorinated hydrocarbons, and that it has extended from its original area to others, while *A. superpictus* is also showing signs of acquiring resistance. Other means of controlling malaria, particularly the use of drugs, command consideration, and where insecticides are used spray programmes should be suspended as soon as possible after malaria

transmission is ended to avoid the risk of development of resistance. [See also this *Bulletin*, 1955, v. 52, 1053.] *G. Macdonald*

Webbe, G. **Dieldrin in Granulated Form as a Mosquito Larvicide. I.—Results of Trials carried out in Artificial Earth Pools.** *Ann. Trop. Med. & Parasit.* 1955, Dec., v. 49, No. 4, 353–5. **II.—Results of Trials carried out in Natural Pools.** *Ibid.*, 356–61.

I. To test the larvicidal powers of dieldrin pellets, artificial ponds were made by partly filling concrete tanks (8 × 10 ft. × 2¾ ft. deep) with mud and adding water. Larvae of *Anopheles gambiae* were added and, after the treatments, about 80 per cent. of them were recovered by sieving the water [see Christie, this *Bulletin*, 1955, v. 52, 120].

Pellets containing 1 per cent. dieldrin were tested at different rates and it was found that about 5 oz. of pellets per acre gave 96–97 per cent. kill, and double this dose a complete kill. The presence of aquatic plants did not seem to affect the kill.

II. Field trials of pellets containing 1 per cent. dieldrin were made with ponds naturally infested with various mosquitoes. The results were assessed by dipping. It was found that 8 weekly treatments of 10 oz. pellets per acre completely suppressed breeding of *Anopheles gambiae* after the second treatment and also reduced culicine larvae to very small numbers. The anophelines reappeared 6 weeks, and the culicines 4 weeks, after the last treatment.

The dieldrin eliminated virtually all other types of aquatic insect during the weekly treatments, but did not seem to harm frogs or crabs.

J. R. Busvine

See also p. 674, Wharton, **The Susceptibility of Various Species of Mosquitos to DDT, Dieldrin and BHC.**

Alves, W. & Blair, D. M. **Malaria Control in Southern Rhodesia.** *J. Trop. Med. & Hyg.* 1955, Dec., v. 58, No. 12, 273–80, 2 maps.

In 1949 a research project and pilot scheme of malaria control in the Mazoe Valley enclave was financed by the Southern Rhodesia State Lottery Trustees. To the European resident in what was previously a blackwater area the success of the use of residual insecticides was quite evident [this *Bulletin*, 1952, v. 49, 15]. From this small beginning there arose an organization of anti-malaria units to deal with 13 African reserves with an area of some 3,000 square miles and a population of 200,000 [*ibid.*, 1954, v. 51, 13]. The reputation of this scheme grew; European administrators and medical officers were not alone in noticing the improvement in child health; African chiefs and enlightened African

women began to press for an extension of spraying operations to their areas in other parts of Rhodesia.

Financial considerations had a material influence on further extensions. To limit expenditure the innovation of the creation of a barrier zone in the north, east and south-east of the country was introduced in 1954; at the same time the strength of benzene hexachloride application during October, November and December was doubled, *i.e.*, 2 lb. of 10 per cent. BHC wettable powder in 3–3½ gallons of water were used: this gave an application of gamma-isomer of about 75 mgm. per square foot which it was hoped would be lethal for 6 months. By this means a vastly larger territory was covered than ever previously without increase in staff and at much less expenditure on transport. The ensuing potential malaria season was an anxious time but no outbreak occurred despite epidemics in 2 areas which were contiguous to the sprayed zones in the south-eastern part of the country.

In 1955–56 this barrier system is to be extended so that the whole of the populated plateau country in the centre of Southern Rhodesia will be protected from invasion by *Anopheles gambiae* from the low-lying terrain of the Zambesi and Limpopo valleys and the Portuguese border [see Leeson, this *Bulletin*, 1932, v. 29, 138]. The progress of malaria control and the peripheral barrier scheme are clearly illustrated in 2 sketch maps. This barrier scheme achieves indirect protection of a large population by direct protection of one-third of their numbers. The scheme offers the greatest good to the greatest number at the minimum expenditure of men and materials.

The really important gametocyte reservoir is the young African; by preventing *Plasmodium falciparum* transmission from him to Europeans and other Africans living in the centre of the country the most significant link in the chain of malaria can be broken. Later when an assessment of the success or otherwise of this barrier scheme can be completed, the exhibition of a gametocytocidal drug to the entire population living in the sprayed areas will be considered. In this respect the difficulty lies in the large number of migrant African labourers entering the country from the endemic malaria areas to the north and east of Southern Rhodesia.

An investigation is to be conducted into the possibility of *A. gambiae* having become zoophilic in those areas which have been treated with residual insecticides.

In one reserve which has been under treatment since 1949 parasitological investigation shows that malaria transmission is still taking place at a very low level.

The paper concludes with a general discussion of techniques and materials and costs. A table gives the hospital morbidity rate per 1,000 of the European population for malaria and blackwater fever for the years 1904–54; this annual figure for malaria has fallen from 22·95 in 1919 to 2·6 in 1954; there were no cases of blackwater fever in 1954.

R. Ford Tredre

Bhombore, S. R., Sitaraman, N. L. & Achuthan, C. **A Preliminary Note on the Behaviour of Anophelines in Structures treated with D.D.T. and B.H.C.** *Indian J. Malariology.* 1955, Sept., v. 9, No. 3, 213–221, 2 figs. on 2 pls. & 2 charts.

Using various anopheline species of the sub-montane Malnad tracts of Mysore State, India, the authors investigated their feeding habits and the phenomenon of excito-repellency in cattle-sheds treated with DDT and BHC. Two villages were selected for the investigation, which began in February and ended in May, owing to the significant dwindling in numbers of the mosquitoes on the approach of the dry season.

The first phase of the investigation was the systematic hand-catching of mosquitoes in the cattle-sheds at specific times throughout each day for 4 weeks. All mosquitoes caught were identified and counts made as to numbers unfed, fully fed, partially digested, and fully gravid. During the next 4 weeks, in addition to hand-catching, window traps were used. Window-trap collections were removed every 4 hours, identified and abdominal condition of the mosquitoes was recorded.

The cattle-sheds were then treated with the insecticides and collections made as before. In one of the villages one cattle-shed was sprayed with 75 per cent. DDT wettable powder at 200 mgm. per sq. ft. and another with BHC P.520 at 22 mgm. per sq. ft. In the other village one shed was treated with 100 mgm. DDT per sq. ft. and another with 11 mgm. BHC per sq. ft.

The authors observed, before the spray, that there was a tendency for a large percentage of mosquitoes with partially digested blood to leave the cattle-sheds. After spraying, the numbers resting indoors decreased. Many blood-fed mosquitoes were caught in the traps of the treated sheds. It is evident that, despite the insecticide, active feeding does take place. The peak feeding time was the same as before the spray. That large numbers are caught in the treated window traps is evidence that there is a definite excito-repellency. Furthermore, it was observed on some occasions that mosquitoes went to the traps immediately on becoming contaminated.

The mosquitoes might have picked up a lethal dose before getting excited and repelled; in the DDT shed, up to the third day, mosquitoes caught in window traps exhibited characteristic symptoms of DDT poisoning. The repellent effect of BHC was found to be comparatively much less. *W. Z. Coker*

Floch, H. Le programme de la suppression du paludisme du continent américain. [**Programme of Suppression of Malaria in the American Continent**] *Méd. Trop.* Marseilles. 1955, July–Aug., v. 15, No. 4, 409–18.

The principal item before the 14th Panamerican Sanitary Conference was the elimination of malaria from the Americas. The Conference was opened by papers reviewing the position and stating that 60 million people lived in eradication areas, 45 million in protected areas, and 30 million in unprotected areas, and including a reference to the remarkable elimination of malaria from British Guiana. The author points out that French Guiana resembles the hinterland of British Guiana in which eradication is incomplete. In the French territory a campaign was started in 1949; by 1952 it had reduced malaria cases by 98·8 per cent. and, in 1953, 9 cases only could be discovered, all of these persons having contracted the infection elsewhere [this *Bulletin*, 1955, v.·52, 12, 511]. Elimination had been apparently achieved but in 1954 there were several hundred cases among immigrants from the Antilles and in the local population in the areas where they settled. This was undoubtedly an importation into a zone which had been cleared, and raises urgently the need to apply a quarantine and treatment mechanism to immigrants from inadequately protected zones.

Included in the resolutions of the Conference was one recommending that those countries which had not already done so should forthwith initiate an energetic and properly supervised programme for the elimination of malaria from their territories. To this there was an addendum drawing attention to the risks of anopheline resistance to insecticides and to the risks following importation of malaria into countries which had been cleared. It emphasized the need for eradication programmes but also requested the Panamerican Sanitary Bureau to study the international measures which might be taken to ensure the protection of cleared territories from importation of the disease. The way was thus paved for the institution of quarantine against malaria. [For other information relating to the Conference, see this *Bulletin*, 1956, v. 53, 283.] *G. Macdonald*

Dehné, E. J. **Fifty Years of Malaria Control in the Panama Area.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 800–11, 4 figs. [22 refs.]

The isthmus and town of Panama are known to have had a pestilential history, and the town experienced malaria and total death rates of 33·8 and 109·7 per 1,000 in 1885. Responsibility for health was accepted by the United States in 1904 and the author reviews progress during each of the 5 following decades. In the first, Gorgas initiated control but met with much opposition and in 1905 also had to combat an epidemic of yellow fever. Despite early failures he soon secured reasonable sanitation which was extended to the towns of Panama and Colon during the decade. During the second decade there was a considerable setback owing to war and deployment of troops. The third was on the whole

progressive. The Gorgas Memorial Laboratory was established in 1930 and with it came much elaboration of survey and extension of experiment in methods of control for town and country alike. The fourth decade started in a similar manner, especially with the development of methods of imagicidal attack, but progress was retarded during the second world war by the deployment of troops among some of whom the malaria rate again rose to 116·4 per 1,000. The fifth decade is one of substantial progress. It was realized that there were several endemic and epidemic foci of malaria within very short distances of the towns and other important areas, and that they were an increasing source of risk owing to movement of the population. Moreover, in 1949 there was a recurrence of yellow fever. In response there has been a wide extension of malaria control beyond town and military limits. *G. Macdonald*

Concha y Venegas, J. A. Die Organisation der Malaria-Dienste in Columbien. [**Organization of Malaria Control in Colombia**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Oct., v. 6, No. 3, 336–43, 1 fig.

The organization of malaria control in Colombia is described. Malaria occurs up to 1,600 metres above sea level and, in 1950, 700,000 cases were recorded out of a population of about 12 million, of whom 7 million live in possible malarious areas. Eight species of *Anopheles* (*A. darlingi*, *A. albimanus*, *A. nuñez-tovari*, *A. neivai*, *A. punctimacula*, *A. pseudopunctipennis*, *A. mediopunctatus*, *A. eiseni*) are given as proved vectors, and 3 species (*A. albitarsis*, *A. aquasalis*, *A. triannulatus*) are given as probable vectors of malaria. Thirty species of *Anopheles* are listed from Colombia but *A. pseudopunctipennis* is omitted from this list and in the summary 34 species are said to occur. DDT is sprayed twice a year in all houses in a malarious area. A routine survey before and after spraying is based on the examination of blood of sick persons and children under 2 years. The figures given show a decrease in positive blood samples after spraying over the years 1952 to 1954. There is only one reference. *B. R. Laurence*

Coda, D. & Ramos, A. da S. A malária na cidade de Santos (2.ª contribuição). [**Malaria in the City of Santos—2nd Contribution**] *Folia Clin. et Biol.* S. Paulo. 1954, July–Aug., v. 22, Nos. 1/2, 113–20, 2 figs. English summary.

An account of malaria in the City of Santos, São Paulo, was published by the authors in 1947 [this *Bulletin*, 1950, v. 47, 430]. They showed that malaria transmission took place in most parts of the city but that endemicity was of a low grade. They listed 12 species of *Anopheles* of

which *A. tarsimaculatus* [*A. aquasalis*] was responsible for most if not all of local malaria transmission.

In November 1947 the Malaria Prevention Service began systematic DDT spraying. In all 19,429 houses were sprayed, of which 12,251 were within the city boundaries. Since 1949 there has been no evidence of malaria transmission within the city; *A. tarsimaculatus* has been eliminated. *Norman White*

Corradetti, A. **Studies on Comparative Pathology and Immunology in *Plasmodium* Infections of Mammals and Birds.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, July, v. 49, No. 4, 311–33, 8 figs. (7 on pl.). [Numerous refs.] Discussion 333–8 [Garnham, P. C. C.; Bray, R. S.; Terry, R. J.; Zuckerman, A.; Corradetti, A. (in reply)].

This paper gives a general account of work done by the author since 1938 on exo-erythrocytic schizogony of different species of *Plasmodium* in relation to immunity, much of which has already been abstracted in this *Bulletin* [1951, v. 48, 437; 1952, v. 49, 371; 1953, v. 50, 91, 601; 1955, v. 52, 250]. The use of a new technique—repeated brain biopsies—has allowed the course of *Plasmodium gallinaceum* to be followed in brain capillaries for many weeks. Exo-erythrocytic schizonts first appeared on the 11th day of blood infection and lasted until the 34th day; before the 11th day, the reticulo-endothelial system was engaged in phagocytosis of pigment. After this time, the endothelial cells became immune to the tissue forms of the parasite and neither superinfection with blood or exo-erythrocytic forms of the parasite, nor splenectomy allowed tissue forms to reappear in the cerebral capillaries. However, if splenectomy was performed on birds in which exo-erythrocytic schizogony was still occurring then the development of immunity was upset and such forms might then persist for 10 weeks or longer. These phenomena were found in both blood- and sporozoite-induced infections, the only difference being that in the former the appearance of exo-erythrocytic forms was later and might never occur if the immunity " crisis " took place before the 11th day.

P. relictum and *cathemerium* behaved much the same in canaries, though strains differed in their ability to produce tissue forms. *P. elongatum*, on the other hand, had a totally different effect on the bird, which is unable to elaborate any system of defence, exo-erythrocytic parasites growing independently in cells of the haemopoietic series. *P. berghei* produced a true and complete immunity in rats within 50 days of the end of the primary attack, and even splenectomy after recovery on one occasion was accompanied by the survival of the animal from an acute re-infection. The development of immunity was slight in blood-induced *P. cynomolgi* infections in monkeys; parasites persisted from 174

to more than 703 days; and *P. malariae* for 34 weeks in man. Splenectomy of rats and monkeys was never followed by the appearance of exo-erythrocytic parasites (10 liver biopsies of monkeys were performed); it is suggested that parasites living in erythrocytes have a greater chance of escaping the effect of immunity than do parasites living in tissue cells.

P. C. C. Garnham

Fulton, J. D. & Spooner, D. F. **The Biochemistry and Nutrition of *Plasmodium berghei*.** *Indian J. Malariology.* 1955, Sept., v. 9, No. 3, 161–76. [Numerous refs.]

The authors have reviewed the available information regarding the biochemistry of *P. berghei*. They point out that biochemical studies of the parasites have not always been made in relation to the actively metabolizing reticulocyte, which is the common host cell. For example, Kruszynski's micro-incineration studies [this *Bulletin*, 1953, v. 50, 282] showed that parasitized cells contained more calcium than normal red cells, but the content of reticulocytes was not examined. The latter should be determined before any conclusion can be drawn as to the origin of the excess calcium in the parasitized cell. Studies on nucleic acid patterns in the growing parasite indicate that synthesis of these acids takes place, as in other plasmodia, but quantitative data are unacceptable until the content of the reticulocytes has been determined.

The pigment produced by the parasite during its growth was identified as haematin by Fulton and Rimington [this *Bulletin*, 1953, v. 50, 1015], this being similar to pigments produced by other plasmodia. Recent work indicates that the pigment contains haematin combined with a protein and not in the free state.

The results of research on the respiration of *P. berghei* are reviewed. The carbohydrate metabolism probably follows the same pattern as in other malaria parasites. Interpretation of results is, however, difficult owing to the active carbohydrate metabolism of the reticulocyte. Pyruvate is oxidized *via* the Krebs cycle. The respiration of both normal and infected reticulocytes is inhibited by cyanide, suggesting that the parasite contains a cytochrome system. There is evidence that *P. berghei* uses plasma glucose as a source of energy in addition to some unidentified substrate in the host cell.

The nutritional requirements of *P. berghei* are discussed in relation to those of other plasmodia. The information available is difficult to assess. The authors suggest that the inhibiting effects of the administration of milk to the host animal, or of starvation, probably arise not from deficiency of any specific substance such as PAB or methionine, but from the lack of a diet which could provide all the essential " building blocks ".

A great deal more requires to be done in the field of research into the metabolic pathways and requirements of the *P. berghei* and its relation to the specialized environment of its host cell. *B. G. Maegraith*

Fabiani, G. & Orfila, J. Analyse pharmacologique du choc survenant au cours du paludisme de la souris. [**Pharmacological Basis for the Shock occurring in Mice during Malaria Infection**] *C.R. Soc. Biol.* 1955, Aug.–Sept., v. 149, Nos. 15/16 & 17/18, 1541–3.

The authors have observed on many occasions deaths occurring in mice a few days after infection with *P. berghei*, in absence of heavy parasitaemia or severe anaemia [this *Bulletin*, 1955, v. 52, 251]. Erythrocyte counts have indicated the occurrence of haemoconcentration and the condition appears to be one of shock, with tremors, dyspnoea, slowing of the heart rate and cyanosis followed in a short time by death. Trauma as the result of inoculation, suprarenal insufficiency or histamine have been ruled out as the cause of the condition. The shock appeared to resemble that due to acetylcholine. The authors therefore used atropine at the appropriate time to combat shock, in some cases with success. At the same time they determined whether the infected mice were specially sensitive to acetylcholine at the start of infection and this proved to be the case. The effect of a nerve-blocking agent (Largactil [chlorpromazine]) was also tested and found to prolong the period of shock. The view that malarial shock is due to a cholinergic agent is strengthened by its response to atropine and the fact that at the period when it occurs the infected mouse is very sensitive to acetylcholine. *J. D. Fulton*

Cardinali, G. & Carrescia, P. M. Ricerche sugli effetti dell'*N-ossido della metil-bis* (*β-cloroetil*) *amina* sulle infezioni da *Plasmodium gallinaceum* e da *Plasmodium berghei*. [**Studies on the Effects of Methyl-*bis* (β-chloroethyl)-amine-N-Oxide or *Plasmodium gallinaceum* and *P. berghei* Infections**] *Riv. di Malariologia*. 1955, Dec., v. 34, Nos. 4/6, 273–6, 1 fig. [11 refs.]

The English summary appended to the paper is as follows:—

"The effect of a nitrogen mustard derivative, methyl-bis (β-chloroethyl)-amine-N-oxide, on chickens infected with *P. gallinaceum* and on white mice infected with *P. berghei* has been studied. In the infections by *P. gallinaceum* the course of the infection and the behaviour of the parasite did not show significant variations; in the infections by *P. berghei* a transitory decrease of the parasitic level was observed."

Taylor, D. Jane & Greenberg, J. **Hyperactivity of Metachloridine against *Plasmodium gallinaceum* in Chicks maintained on a Purified Diet.** *Proc. Soc. Exper. Biol. & Med.* 1955, Nov., v. 90, No. 2, 551–4.

Since some antimalarial agents are believed to be antimetabolites it seemed possible that the purity of a diet used during therapy might

influence the results obtained with some agents of this type. This result could arise owing to the difference in content of natural metabolites present in unpurified diets.

The effect of a stock and purified diet on infection with *P. gallinaceum* was studied in normal and drug-treated chicks. Of 9 drugs tested only metachloridine (2-metanilamido-5-chloropyrimidine) and sulphadiazine showed activity in chicks fed on a purified diet greater than those fed on a stock diet. A search was made for a possible inhibitor in the stock diet. The diets being investigated were started when the chicks were one day old. The drug tests were carried out as previously described [this *Bulletin*, 1954, v. 51, 352] by inoculation of week-old birds intravenously with 16×10^6 parasitized erythrocytes. Drugs were given orally twice daily for 4 days starting a few hours before inoculation, and parasite counts were made in stained films starting on the day when treatment ended. The drug under test was given at different dosage levels for each variation in composition of the diet.

It was found that *P. gallinaceum* multiplied equally in chicks on a purified or stock diet. The two drugs named were about 16 times as active when a purified diet was used. The greater activity of sulphadiazine was attributed to the absence of *p*-aminobenzoic acid (PAB) in this instance. The absence of PAB, however, did not account for the increased activity of metachloridine. There appears to be a substance in soya bean meal other than the protein or fatty constituents which inhibits the latter drug. *J. D. Fulton*

Ramaswamy, A. S. **Studies on the Nature of Hydroxy-Proline from the Malarial Spleen** (*Pl. gallinaceum*) **in Chicks.** *J. Indian Inst. Sci.* 1956, Jan., v. 38, No. 1, 62–72, 1 text fig. & 3 figs. on 2 pls. [45 refs.]

Trager, W. & Singer, I. **An Antimalarial Effect** *in vitro* **of Parapyruvic Acid.** *Proc. Soc. Exper. Biol. & Med.* 1955, Nov., v. 90, No. 2, 539–42.

The author has shown previously that *in vitro* the survival of *P. lophurae* freed from host red cell was favoured by addition of adenosine triphosphate (ATP) and by sodium pyruvate [this *Bulletin*, 1951, v. 48, 130; 1955, v. 52, 1146]. The favourable effect of the latter was not observed when commercial samples of the acid were used, and this discrepancy in results was traced to the presence of a lactone of a dimer of pyruvic acid (parapyruvic acid). The effect of this substance has been tried on *P. lophurae in vivo* and also with and without red cells *in vitro*. *P. lophurae* parasites freed from duck host cells by antiserum in presence

of complement were separated by differential centrifugation. The cell-free parasites were maintained in culture under conditions previously described [*ibid.*, 1953, v. 50, 195] at 40°C. in an air-CO_2 atmosphere and suitable dilutions of the drug were added. Intracellular parasites were used under comparable conditions [*ibid.*, 1947, v. 44, 1046; 1950, v. 47, 1067]. The development of the parasites was followed in Giemsa-stained films. Parapyruvate had a detrimental effect on their development under both conditions. Its effect was believed to be due to interference with the utilization of α-ketoglutarate in the Krebs cycle in which certain malaria parasites participate during metabolism [*ibid.*, 1946, v. 43, 1116]. Parapyruvate had no antimalarial action when given intravenously to ducklings infected with *P. lophurae*. *J. D. Fulton*

Khabir, P. A. & Manwell, R. D. **Glucose Consumption of** *Plasmodium hexamerium*. *J. Parasitology*. 1955, Dec., v. 41, No. 6, 595–603, 3 graphs. [13 refs.]

P. hexamerium, a small parasite producing heavy blood infections in ducklings, is one of the less well known species of plasmodia. It has been studied but little from the physiological point of view and for that reason was used in the present study. The methods employed were those previously described by Warren and Manwell [this *Bulletin*, 1954, v. 51, 541]. Ducklings less than a week old were inoculated intravenously with infected blood from a donor bird containing 100 to 400 million parasites. In order to measure glucose consumption over stated periods blood was withdrawn and kept under culture conditions. Counts of red cells, reticulocytes and parasitized red cells were made on the samples, and the utilization of glucose by all 3 types determined. Glucose consumption was expressed in relation to the surface area of the parasites. It was found that the metabolism of glucose by reticulocytes was about 5 times that by a mature red cell and about equal to that of an "average parasite" of *P. hexamerium*. Results indicated that this parasite prefers mature red cells to younger forms. It used considerably less sugar per unit of area than *P. relictum* or *P. gallinaceum*.
J. D. Fulton

TRYPANOSOMIASIS

*In this section abstracts are arranged as far as possible in the following order:—*African*—human, animal;* American*—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Lambrecht, F. L. Contribution à l'étude de la répartition des tsé-tsés dans les territoires du Ruanda-Urundi. [**Study of the Distribution of Tsetse Flies in Ruanda-Urundi**] *Ann. Soc. Belge de Méd. Trop.* 1955, Aug. 31, v. 35, No. 4, 427–37, 1 folding map.

The author describes in detail the distribution of tsetse flies along the frontier between Ruanda-Urundi and Tanganyika. The area covered lies between 1° and 4° 30′ S., from the Kagera river and the Uganda border in the north to the Malagarasi river in the south.

The main species of tsetse concerned is *G. morsitans* which occurs in a number of isolated patches or pockets. The largest of these is in the northern tip of the area, in the angle between the Kakitumba and the Kagera rivers. There are also a number of smaller pockets to the south. The author discusses this patchy distribution, which he concludes is mainly due to topographical and climatic factors; these, together with man's cultivation, have combined to break up the tsetse belt into these small discrete pockets. The presence, absence or fluctuating abundance of game animals are further factors concerned. The dry-season haunts of the fly in relation to its distribution are also described.

In addition to this species, *G. pallidipes* is recorded from one area in the northernmost belt, on the upper reaches of the Kakitumba river, and *G. brevipalpis* in the southernmost belt, on the Malagarasi river just north of 4° S. In an appendix are given localities in which *G. palpalis* (var. *martinii*) have been found along Lake Tanganyika and in the valley of the Ruzizi river to the north of the lake. In 4 of these localities, the flies were caught in banana groves.

In a discussion, Professor Rodhain draws attention to the observations made by Henrard [see this *Bulletin*, 1952, v. 49, 847] and Evens (*Inst. Roy. Sci. Nat. Belgique, Mémoires*, 2e série, 1953, No. 48) relating to this area. *W. H. Potts*

Willett, K. C. & Fairbairn, H. **The Tinde Experiment: A Study of *Trypanosoma rhodesiense* during Eighteen Years of Cyclical Transmission.** *Ann. Trop. Med. & Parasit.* 1955, Oct., v. 49, No. 3, 278–92, 7 figs. [14 refs.]

The exact relations between *Trypanosoma rhodesiense* and *T. brucei* have been a matter of controversy for more than 40 years, although the close affinity between these two species is generally recognized. In fact, Yorke and his associates [this *Bulletin*, 1930, v. 27, 804] maintained

that *T. rhodesiense* was so unstable that it would revert to its ancestral form, *T. brucei*, if passaged cyclically through mammals other than man. This challenge was taken up in Tanganyika by Corson [*ibid.*, 1936, v. 33, 651], who in 1934 started cyclical passages through sheep, which were continued uninterruptedly by his successors, Fairbairn and Willett. In the present paper, the authors describe the results obtained up to 1953, when the strain had been transmitted through 115 sheep in the course of 18½ years, as well as through side-lines in antelopes and monkeys. In the course of this work yearly tests were made of the infectivity of this strain to man.

The main sheep line of *T. rhodesiense* remained infective to man during the whole period of the experiment (18½ years) when 138 volunteers were inoculated, with positive results in each batch tested. In the course of this time the incubation period in man has been steadily increasing, indicating that the virulence of the strain is decreasing. Moreover, the infectivity of this strain to man fluctuated cyclically. Similar changes have occurred in the sheep themselves, in which a gradual loss of virulence of the strain was revealed in a progressive increase in the length of survival of infected sheep.

In 1936 an antelope line was diverted from the 12th sheep passage, and maintained in buck till 1948, while in 1940 a branch line from 36th sheep passage was introduced into monkeys (*Cercopithecus*) in which the strain was maintained for 7 years, and finally the simian line was returned to sheep. The antelope line also retained its infectivity to man during the 12 years of observation, with frequent fluctuations, which contrasted with the slow variations in the sheep line. On the other hand, the simian line —which was also infective to man—showed little variation in infectivity, but its virulence for monkeys increased progressively until the line was lost. In a number of cases monkeys proved to be resistant to infection.

All the data on infectivity, its fluctuation, and their significance have been subjected to statistical analysis, for details of which the reader is referred to the original. *C. A. Hoare*

Bursell, E. **Experiments in Tsetse Control in Southern Tanganyika.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 589–97, 4 figs.

A survey is described delimiting the westward spread of *Glossina morsitans* from the main eastern fly-belt, into Songea District, Southern Tanganyika. This invasion began in 1941, and by 1953 had reached as far west as the shores of Lake Nyasa.

Data were obtained from fly rounds 3 to 4 miles long in representative areas; each was traversed 4 times monthly. Fly density is expressed as Apparent Density (*i.e.*, the number of non-teneral males per 10,000 yd. of fly round).

The characteristic vegetation of the area, as of most of southern Tanganyika, is the dry sub-climax *Brachystegia-Pseudoberlinia* woodland

(*miombo*), which forms a more or less continuous canopy at 30–50 ft., together with various lower-storey elements. The *miombo* is interrupted at intervals—usually along the tops of ridges—by glades representing the sites of abandoned villages. The interzone between these clearings and the woodland is characterized by a well-marked double canopy, with short grasses at ground level grading into the taller grasses and shrubs of the glades themselves.

Fly-round catches indicated clearly that *G. morsitans* is closely associated with the glades in the *miombo*: in the dry season the Apparent Densities are 3–5 times as high as in the surrounding woodland. In the wet season, although the flies are more evenly distributed, a clear preference is still exhibited in favour of the clearings. Further, replete flies predominate in the clearing catches, while hungry flies predominate in the catches made in the woodland nearby. These observations, based on catches of adult flies, are also borne out by pupal surveys, where the highest densities were found in the clearing interzones.

These findings show that the glades in the *miombo* represent a preferred habitat, or concentration area, for *G. morsitans*. Such results are in marked contrast to those obtained elsewhere in the Territory, where hungry flies are most numerous in the open *mbuga* and replete flies are chiefly found in woodland [Jackson, this *Bulletin*, 1931, v. 28, 521]. This latter type of distribution led to the formulation of the feeding-ground theory [Nash, *ibid.*, 520], which is obviously not applicable, for some unknown reason, to the situation existing in Songea.

A study of seasonal population fluctuations shows that peaks occur in the rainy season, fall off in the ensuing dry season, with a partial recovery in August, followed by a second trough in September and October. The annual cycle of fluctuation shows a rough negative correlation with saturation deficiency.

The invariable association of high fly densities with ridge-top glades in the *miombo* suggested that discriminative clearing of the glade interzones would be efficacious in reclaiming the invaded areas; this was borne out in an experimental area of 14 square miles, and it is concluded that destruction of the "fringe-habitat" is achieved adequately by clearing the upper canopy, and that this in turn results in a drastic reduction in fly populations. It is suggested that by this means of upper canopy clearing there is little danger of the reconstitution of a suitable habitat within a period of perhaps 20 years. *D. M. Minter*

Fromentin, Huguette. Action du salicylate de sodium sur deux souches de *Trypanosoma gambiense* chez le rat blanc. [**Effect of Sodium Salicylate on Two Strains of** *Trypanosoma gambiense* **in the White Rat**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 5, 651–5.

With the intention of aiding the adaptation of certain strains of *T. gambiense* in laboratory animals, the authors have used sodium salicylate

as previously described by Becker in the case of *T. lewisi* in the rat. The first strain was isolated in 1951 and passaged in guineapigs and then mice; it failed to give heavy infections or cause death in rats. Twenty-four animals were therefore inoculated with about 2 million trypanosomes intraperitoneally. On the same day 12 of these rats were given 45 mgm. sodium salicylate orally per 100 gm. body weight, and this dose was repeated daily while the remaining animals served as controls. In those rats which received drug the infection was intensified and prolonged and aided by splenectomy. Death of the hosts was, however, probably caused by overdose with salicylate and in the mouse and guineapig an increased or prolonged infection did not result from the same treatment. This treatment was accorded another strain of *T. gambiense* which could not be maintained in rats or mice. The favourable action of sodium salicylate was again improved by splenectomy and especially by the further addition of benzene emulsified in gum arabic. The strain previously maintainable only in guineapigs could by these means be passaged in rats and infection sometimes proved fatal. *J. D. Fulton*

Devignat, R. & Dresse, A. Micro-technique simple et rapide de concentration du sang en trypanosomes. [**Simple and Rapid Micro-technique for Concentration of Trypanosomes in Blood**] *Ann. Soc. Belge de Méd. Trop.* 1955, June 30, v. 35, No. 3, 315–21.

A description is given of a new method for concentrating and detecting trypanosomes in blood within capillary glass tubes. They are made by drawing out Pasteur pipettes to a length of 12 cm., with a diameter of 1 mm., after which these tubes are sawn off and a solution of paraffin wax in chloroform (1 in 19) is aspirated into each by means of a special pipette, to which the capillary tubes can be attached. After evaporation of the chloroform, a thin layer of wax is left on the inner surface of the tubes, which prevents coagulation of the blood. For diluting the blood, sterilized Alsever's isotonic solution of the following composition is used: 2·05 gm. glucose, 0·80 gm. trisodium citrate, 0·42 gm. sodium chloride, 1 gm. " Liquoïde Roche ", 100 cc. distilled water.

The procedure itself is as follows. A droplet of Alsever's solution is placed on a coverslip and to it is added a drop of blood from a rat infected with *Trypanosoma lewisi*, and the two are mixed together. Some of the mixture can be used for a fresh control preparation, while the rest is taken up into the waxed tubes, one end of which is then sealed by flaming. The remnants of the mixture on the slide are allowed to dry as a thick blood film. After labelling the capillary tubes, they are placed in centrifuge tubes, and spun for 10 minutes at 1,000–2,000 revolutions per minute. After centrifugation the various blood elements in these tubes become arranged as in ordinary centrifuge tubes in the following sequence, starting from the bottom: normal erythrocytes, nucleated red cells, leucocytes, trypanosomes, plasma. The trypanosomes can there-

fore be detected directly by examining the tubes under the microscope and focussing at the layer between the blood cells and the plasma.

In the case of *T. lewisi*, the authors have estimated that with blood containing only one trypanosome per cmm. the micro-technique used by them may produce a concentration of 75 trypanosomes at the interface. From these observations they conclude that it should be possible to apply this method for the rapid diagnosis of human and animal trypanosomiasis even under field conditions. *C. A. Hoare*

Alwar, V. S. & Ramanujachari, G. **Transmission of *Trypanosoma evansi* Steel, 1885 from Mammals to Fowls.** Reprinted from *Current Sci.* 1955, Mar., v. 24, 87.

The authors have previously succeeded in infecting chicks with cultures of *Trypanosoma evansi* grown in chick embryos. They now record the successful infection of chicks by inoculation of the blood of guineapigs infected with this trypanosome. In those chicks which received a heavy inoculum, 80 per cent. showed trypanosomes in the blood by the 5th day, the majority dying in 2–3 days. In chicks inoculated with smaller doses, 40 per cent. became infected, with an incubation period of 10 days, but none died. In both groups the infection in the surviving birds lasted 25 days. The lethal effect of *T. evansi* in the birds inoculated from mammals is contrasted with its low virulence in chick embryos.

C. A. Hoare

Atkinson, C. M., Brown, C. W. & Simpson, J. C. E. **Cinnolines and other Heterocyclic Types in relation to the Chemotherapy of Trypanosomiasis. Part XI. Some Reactions of Simple Quinoxaline Derivatives.** *J. Chem. Soc.* 1956, Jan., 26–30.

Brant, T. C., de Bustamante, F. M., de Mello, A. L. & Batista, S. M. Doença de Chagas no Município de Itaqui, Estado do Rio Grande do Sul. [**Chagas's Disease in Itaqui, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1955, Jan., v. 7, No. 1, 177–80, 1 map.

The English summary appended to the paper is as follows:—

"In a survey on Chagas' disease in the county of Itaqui, state of Rio Grande do Sul, the prevalence of the disease was determined through the use of the complement fixation test with antigen from *S. cruzi*, in a random sample of urban and rural population. The sera of 1,394 persons were examined. The general index of positivity was found to be 31·92%—24·54% for the city and 36·56% for the rural area. Notwithstanding, in some rural localities the index was much higher. Out of the infected 445 individuals, 247 (55·50%) were born and always lived in the same locality. This is a proof that Chagas' disease is endemic in the county, the prevalence index being very high."

Dias, E. Doença de Chagas nas Américas. VIII) Argentina. [**Chagas's Disease in the Americas. VIII. Argentina**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1955, Jan., v. 7, No. 1, 143–75, 7 figs. [273 refs.]

The English summary appended to the paper is as follows:—

" 1—The geographic distribution of insect vectors, human cases and and animal reservoirs of Chagas' disease in Argentina is recorded.

" 2—The following species of Triatomid bugs have been reported from the country (the ones marked * have been found harboring *S. cruzi*):

Triatoma infestans *
Triatoma platensis *
Triatoma patagonica *
Triatoma sordida *
Triatoma guasayana *
Triatoma rubrovaria *
Triatoma eratyrusiforme *
Triatoma delpontei *
Panstrongylus güntheri *
Triatoma breyeri
Triatoma bruchi
Triatoma rubrofasciata
Panstrongylus megistus
Panstrongylus geniculatus
Neotriatoma circummaculata
Psammolestes coreodes

" 3—*Triatoma infestans* is the most important insect carrier of *S. cruzi*.

" 4—Over 5,000 cases of Chagas' disease have been reported.

" 5—The following species have been found harboring *Schizotrypanum cruzi* infection:

" *Carivora* (*Canis familiaris*, *Felix domesticus*, *Pseudalopex culpaeus culpaeus*, *P. culpaeus andinus*, *P. gracilis gracilis*, *Grisonella huronax*, *G. ratellina* and *Tayra barbara*), *Edentata* (*Dasypus novemcinctus*, *Chaetophractus vellerosus vellerosus*, *C. vellerosus pannosus*, *C. villosus*, *Tolypeutes matacos*, *Zaedyus pichyi caurinus*), *Marsupialia* (*Didelphis azarae*, *Lutreolina crassicaudata paranalis*), *Rodentia* (*Leptosciurus argentinus*)."

Pizzi P., T. & Díaz A., María. Reacción de Feulgen en *Trypanosoma cruzi*. [**Feulgen Reaction in** *Trypanosoma cruzi*] *Biológica.* Santiago. 1954, v. 20, 71–87, 18 figs. on 5 pls. [21 refs.] English summary.

The authors describe investigations on the nuclear constitution of *Trypanosoma cruzi* by means of the Feulgen reaction, the object of which was to throw light on its minute structure and the mechanism of

its division, and to determine the changes in the nucleoproteins produced by chemotherapeutic action and immunological factors. With these ends in view the distribution of nucleic acids was studied in different stages of the life cycle of this trypanosome, the material for which was provided by cultures (corresponding to stages in the insect vector) and by blood films and various tissues of mammalian hosts, represented chiefly by homozygous mice (strain C3H), which provided the trypanosome and leishmanial stages. In addition, similar material was obtained from infected mice treated with primaquine [this *Bulletin*, 1952, v. 49, 382] and from immunized animals. The Feulgen reaction employed in this study represented a modification of the technique described in Langeron's *Précis de Microscopie* (1949. Paris: Masson et Cie.).

The results were as follows. In non-dividing leishmanial and crithidial forms the nucleus appeared in the form of a ring, the " rim " of which was produced by Feulgen-positive substance lining the inner surface of the nuclear membrane, while the central zone was Feulgen-negative. In trypanosome forms this distribution occurred less frequently, but as a rule the Feulgen-positive substance had a crescentic shape or took the form of irregular masses adhering to different parts of the nuclear membrane, while in other cases it was represented by irregular aggregations or it had an areolar arrangement. Sometimes the Feulgen-staining substance underwent fragmentation, which is attributed to mitotic division. There appeared to be 3–4 chromosomes, but their number could not be determined with certainty.

In trypanosomes from animals treated with primaquine the arrangement of the Feulgen-positive substance showed no special peculiarities. As regards the parasites from immunized animals, in those which were phagocytosed by macrophages the Feulgen-positive substance was more compact and had diffuse outlines.

The appearance of the nuclei of various forms of *T. cruzi* subjected to Feulgen's reaction is shown in a series of figures. [For earlier studies by the author, see this *Bulletin*, 1951, v. 48, 531.] *C. A. Hoare*

Rubio D., M. Estudio de los factores que intervienen en la virulencia de una cepa de *Trypanosoma cruzi*.—Acción de la cortisona en la capacidad de invasión y multiplicación del parásito. [**Study of Factors determining the Virulence of a Strain of** *Trypanosoma cruzi*; **Effect of Cortisone on the Invasive and Reproductive Powers of the Parasite**] *Biológica*. Santiago. 1954, v. 20, 89–125, 4 graphs & 22 figs. on 5 pls. [22 refs.] English summary.

The author describes an experimental investigation of strain " T " of *Trypanosoma cruzi*, which had been isolated in Chile in 1945, since when it has been kept in 2 lines: (1) by serial animal passages, in which its pathogenicity remained unchanged, and (2) in serial cultures, the virulence of which for laboratory animals diminished progressively in the

course of 9 years. The object of this study was to determine the factors responsible for the loss of virulence, on the one hand, and to attempt to restore its original pathogenicity, on the other. The behaviour of this strain was observed and compared in homozygous rats (A–C) and mice (CH), inoculated with old and recently isolated cultures, and with blood trypanosomes. In addition, the effect of cortisone and serial animal passages upon its virulence was investigated. The results were assessed by examination of the blood at intervals of 24–48 hours, and of sections from the site of inoculation (peritoneum), heart, spleen, liver and lymph nodes.

The following results of this study throw light on the factors affecting the virulence of cultures of strain " T ". It was found that in rats and mice, inoculated intraperitoneally with cultures, the crithidial forms—which are predominant—are lysed or phagocytosed or both by macrophages at the site of inoculation. As regards the trypanosome and leishmanial forms, they were not lysed, but, as the culture grew older, progressively greater numbers of them were disposed of by phagocytosis in the tissues, on the one hand, and the rate of reproduction of the leishmanial forms and their capacity for producing trypanosome forms diminished, on the other hand. Moreover, owing to the scarcity of trypanosomes in the blood, in animals inoculated with old cultures there was a low degree of invasion of the organs. Between the 6th and 12th days of the infection there was also a marked inflammatory reaction in the tissues around aggregations of parasites, resulting in their phagocytosis. The course of infection induced by cultures of strain " T " is contrasted with its behaviour in infections produced by blood inoculation, which provoked only a slight inflammatory reaction, with a minimum of phagocytosis, giving rise to a high degree of parasitaemia and intensive invasion of the host's organs.

Finally, it was shown that the virulence of recently isolated cultures could be reinforced by serial passages through the rodents. As regards cortisone, when administered to the host in doses of 12–15 mgm. per 100 gm. of body-weight, it increased the virulence of both old and recent cultures. It is suggested that this effect is produced by inhibition of phagocytosis by the macrophages, thereby enabling the parasites to multiply unhindered and to produce a sufficient number of trypanosomes, which invade the blood and give rise to high parasitaemia [this *Bulletin*, 1953, v. 50, 95]. The appearances are shown in 22 photomicrographs.

C. A. Hoare

Goodchild, A. J. P. **Some Observations on Growth and Egg Production of the Blood-Sucking Reduviids,** *Rhodnius prolixus* **and** *Triatoma infestans*. *Proc. Roy. Entom. Soc. of London.* Ser. A. 1955, Dec. 30, v. 30, Pts. 10/12, 137–44, 2 figs.

" The two species of blood-sucking Reduviidae, *Rhodnius prolixus* and *Triatoma infestans*, have been studied from the viewpoint of their degree

of adaptation to the blood-sucking mode of nutrition. The relation of nymphal growth and adult egg production to the weight of blood ingested was used as the basis of comparison, with the following results:

" 1. The increments of nymphal growth per unit of blood meal taken are the same in *T. infestans* as in *R. prolixus* (latter figures from Buxton, 1930), but in the later instars of *T. infestans*, a smaller food capacity makes it necessary for the insect to take more than one meal before it can moult. The fifth instar nymph of *R. prolixus* not only takes enough food in one meal for it to moult to the adult, but may retain sufficient unused food to enable the adult female to lay one or two eggs without further feeding. The occurrence of oviposition under these circumstances has not previously been recorded. The eggs laid were found to be fertile.

" 2. Although the adult female of *T. infestans* lays a much smaller number of eggs per blood meal than *R. prolixus*, an analysis shows that this is entirely due to the greater capacity for food of the latter species. A structural adaptation is present in the abdomen of *R. prolixus*, which enables it to take larger meals in relation to its body weight.

" 3. In spite of the smaller food capacity of *T. infestans* adults, they do not feed more frequently than *R. prolixus* when the source of food is continually present. Under such conditions both species will feed about every third day. It would appear, therefore, that the rate of increase of *T. infestans* in a natural infestation must always be lower than that of *R. prolixus*. This study shows that *T. infestans* is less well adapted to the blood-sucking habit than *R. prolixus*."

Pick, F. Cristallisations réduvidiques de l'hémoglobine dans un cas de maladie a hématies falciformes (Sickle-Cell Disease). [**Crystallization of Haemoglobin by a *Triatoma* in a Case of Sickle-Cell Disease**] *Ann. Parasit. Humaine et Comparée.* 1955, v. 30, Nos. 5/6, 425–30, 4 figs.

During investigation of a case of sickle-cell disease in a 10-year-old Negro boy in Ecuador, 60 second-instar nymphs of *Triatoma megista* were fed on the forearms and thighs of the patient. Subsequently, 3 of the bugs were killed daily for examination of their gut contents, thereby extending continuous observations over 20 days, a period considered long enough for crystallization of the ingested haemoglobin to occur despite its known low solubility in cases of sickle-cell anaemia.

Preliminary examination of the patient's blood revealed no abnormalities before or immediately after being bitten, but the sickle-cell condition was seen to affect a third of the erythrocytes in blood taken immediately after the bugs had fed and sealed with vaseline for 24 hours.

In blood samples derived from bugs after consecutive intervals, the following results were obtained. After 24 hours, the sickle-cell condition

had affected all erythrocytes, but no haemolysis or haemoglobin crystallization was detected. After 48 hours, *i.e.*, on the second day following the blood meal, this condition was unchanged; however, an attempt at this stage to induce crystallization by crushing was successful 20 minutes after the mechanical destruction of the blood cells, and a few haemoglobin crystals were formed. By the third day, haemolysis of the sickle cells, and enzymatic lysis of the leucocytes, had begun, and extended during the following 2 days. Haemolysis was complete in 6th-day samples, and there was no observed further change up to and including the 14th day. On the 15th day, samples showed the elaboration of haemoglobin crystals *in vivo* resembling those obtained by physico-chemical methods, but lysis occurred before critical measurements could be made. During the 16th to 19th days, haemolysis remained complete, but no more crystals were observed.

Crystallization *in vitro* was found to occur spontaneously 8 days after the blood meal; that is, two days after the completion of haemolysis. The crystals were atypical by the author's earlier observations [see this *Bulletin*, 1954, v. 51, 157], forming clusters of needle-shaped structures originating from separate points of crystallization. The crystallization process continued until all the available haemoglobin was exhausted.

Throughout the study, no normal crystals of haemoglobin were seen. The blood of 3 half-caste children, investigated along similar lines, showed no sickle-cell effects or haemoglobin crystal elaboration comparable with the original case; it is suggested that the peculiarity may be a racial characteristic, which the author intends to investigate more fully.

N. R. Phillips

Uvo, D., Aguiar, A. A., Carvalhal, S., Paladino, N. & Soubihe, N. V. Estudo comparativo dos resultados da R.F.C. para diagnóstico da moléstia de Chagas, obtidos com a realização das técnicas qualitativa e quantitativa. [**Comparative Results of Qualitative and Quantitative Complement-Fixation Tests in the Diagnosis of Chagas's Disease**] *Folia Clin. et Biol.* S. Paulo. 1954, July–Aug., v. 22, Nos. 1/2, 85–96. English summary.

Carvalhal, S., Portugal, O. P., da Silva, T. L., Ramos, O., Paladino, N. & Aguiar, A. A. Considerações sôbre os resultados da R.F.C. relacionados com os dados epidemiológicos relativos à endemia chagásica. Estudos sôbre indivíduos examinados sorológica, clínica e epidemiológicamente. [**Relationship of the Complement-Fixation Test to Epidemiological Data in the Incidence of Chagas's Disease. Study of Serological, Clinical and Epidemiological Examinations**] *Folia Clin. et Biol.* S. Paulo. 1954, July–Aug., v. 22, Nos. 1/2, 97–104. English summary (7 lines).

Portugal, O. P., Carvalhal, S., Paladino, N., Ramos, O. L., da Silva, T. L. & Mafra F., H. Inquérito clínico epidemiológico e sorológico sôbre a moléstia de Chagas no município de Itaporanga, Estado de S. Paulo. [**Clinical, Epidemiological and Serological Studies on Chagas's Disease in Itaporanga, São Paulo**] *Folia Clin. et Biol.* S. Paulo. 1954, July–Aug., v. 22, Nos. 1/2, 69–78. English summary.

Herbig-Sandreuter, A. Experimentelle Untersuchungen über den Cyclus von *Trypanosoma rangeli* Tejera 1920 im Warmblüter und in *Rhodnius prolixus*. [**Experimental Investigation of the Life-Cycle of *Trypanosoma rangeli* in Warm Blooded Animals and in *Rhodnius prolixus***] *Acta Tropica.* Basle. 1955, v. 12, No. 3, 261–4, 4 figs.

The author describes the results of an experimental study of *Trypanosoma rangeli* in mammalian hosts and in its vector *Rhodnius prolixus*.

In new-born mice, inoculated with cultures of the trypanosome containing numerous metacyclic forms, acute parasitaemia was produced 4–20 days later, after which the infection assumed a chronic form, when the trypanosomes could be demonstrated only by xenodiagnosis or by culture. In macaque monkeys, inoculated similarly, parasitaemia was only slight.

In an attempt to discover reproductive forms of *T. rangeli* numerous infected mice were examined histologically from 24 hours to 3 months after inoculation. However, the examination of the organs in thousands of sections failed to reveal any tissue forms, and it is concluded that the trypanosomes multiply in the blood, though no dividing forms were seen there. Neither the mice nor monkeys showed any symptoms of the infection.

Since attempts by previous workers to transmit *T. rangeli* through the faeces had failed, it was thought that this might be due to the scantiness of metacyclic trypanosomes in the droppings. To test this view, bugs were fed with cultures rich in metacyclic forms, and it was found that their number in the faeces increased from 7 in naturally infected insects, to 50 per 100 microscopic fields in those infected artificially. Attempts were made to transmit the infection to mice with the " enriched " faeces by placing a drop on intact and scarified skin, and by subcutaneous injection: positive results were obtained only by the last route. [In other trypanosomes completing their development in the " posterior station " of the vector the normal portal of entry is represented by intact mucous membranes, but transmission by this route has apparently not been tried by the author.]

Like previous workers, the author has shown that, some weeks after an infecting feed, the flagellates in the bug invade the haemolymph and

salivary glands, where numerous metacyclic forms are found, indicating that the infection can be transmitted through the bite of the vector.

C. A. Hoare

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

Nag, J. K. & Ghose, M. B. **Kala-Azar with Pulmonary Tuberculosis.** *J. Indian Med. Ass.* 1955, July 16, v. 25, No. 4, 138–9.

An Indian male was diagnosed by X-ray examination of the chest as suffering from pulmonary tuberculosis (the reproduction of the skiagram shows moderately dense shadows extending over the whole of the right upper and middle zones and the left upper zone). He was treated with streptomycin and PAS by his doctor with a satisfactory result, but was admitted to hospital. The lung condition had improved since the original skiagram was taken, but he still had fever, slight leucopenia (4,200 per cmm.) and anaemia (3·5 million red cells per cmm.). Streptomycin (1 gramme daily) and PAS (10 grammes daily) were continued but his fever began to mount and the spleen and liver increased in size. A diagnosis of kala azar was made on the serum tests and pentamidine was given on alternate days. After 6 injections, as the patient's condition appeared to be deteriorating, the pentamidine was stopped and urea stibamine was given in very small doses at first (0·025 gm.) up to a maximum of 0·2 gm. and a total of 2 gm. The anti-tuberculosis treatment was continued at the same time. The patient now made a rapid recovery.

[No acid-fast bacilli were found in the sputum, but no examination was made prior to the commencement of treatment, nor was *Leishmania* demonstrated. The diagnosis of kala azar was, however, on surer grounds than that of pulmonary tuberculosis. The clinical improvement in kala azar is often delayed until the course of diamidines is completed; in this case only 6 injections were given and the improvement reported after urea stibamine might well have been in part due to the pentamidine. There was apparently no follow-up. In view of these facts, it would be advisable not to accept this case as upsetting a fairly well established opinion that kala azar patients with pulmonary tuberculosis do not do well on pentavalent antimony.] *L. E. Napier*

Agius-Ferrante, T. J. **Infantile Visceral Leishmaniasis in the Maltese Islands.** *Brit. Med. J.* 1955, Sept. 10, 654–6. [15 refs.]

"The main purpose of this paper is to record the decline in the incidence of leishmaniasis in the Maltese Islands over the past eight

years, to comment on the literature perused during its preparation, and to review the insecticide residual technique used against the vector. It will also serve as an introduction to a later paper which will deal with epidemiological figures relating to the part played by the sand-fly in transmission of the disease."

Kala azar was first diagnosed in infants in Malta in 1909: the next year it was found in a dog. The disease did not appear in the mortality records in Malta before 1938 when it was bracketed with " other disease due to protozoa ". Kala azar was made notifiable in 1946.

From 1947 to 1954 the annual incidence was 191, 204, 91, 66, 58, 55, 63 and 49, respectively, a total of 777 cases, and the numbers of deaths from the disease during these same years was 12, 9, 3, 1, 3, 0, 1 and 0. [If these figures are correct it will be necessary to revise the generally accepted opinion on the difficulty of treating the Mediterranean form of kala azar.] The median of the age-group curve is between 2 and 3 years, and only 10 patients were over 10 years of age.

Towards the end of 1946, an anti-sandfly campaign was launched. " Disinfection with D.D.T. is carried out in all bedrooms, etc., as soon as a case of leishmaniasis is reported to him by the medical officers of health. After a month a second spray of D.D.T. is given."

The author adds: " Nor did we spray the animal reservoir ". He concludes: " The sudden drop in the number of cases in 1949 and the falling incidence since then appear to be due to the D.D.T. residual technique ".

[The author's conclusion is not very convincing. It is to be hoped that the promised paper on the epidemiology will clarify the position. The abstracter will, however, be surprised if this very perfunctory attempt at controlling the disease has any real effect on its incidence. The diagnosis of a case of kala azar may be delayed for several months, during which time several generations of sandflies will have fed on the patient and will possibly already have transmitted the disease. Immediately the disease is diagnosed the patient would presumably be treated; the parasites would rapidly disappear from the peripheral blood so that by the time spraying was undertaken there would be only relatively few infected flies to be killed by the residual spraying. The drop in incidence appears to have coincided also with the institution of efficient treatment; this may well have been the cause of the drop. Or it may have been a coincidence, since periodic rising and falling in the incidence curve is a characteristic of the epidemiology of the disease.

Finally, little is said about the dog, the main animal reservoir—which in the opinion of many Mediterranean parasitologists and epidemiologists is at least as important a source of infection as the human case—except that it was not sprayed.] *L. E. Napier*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

Montoya, J. A., Jordan, Martha E., Kvamme, L., Quiros S., C. & Fox, J. P. **A Survey of Sero-Immunity against Epidemic Typhus among Certain Population Groups in Peru.** *Amer. J. Hyg.* 1955, Nov., v. 62, No. 3, 255–69. [15 refs.]

The authors describe the findings obtained in a survey of the age distribution of louse-typhus antibodies in regions of Peru where conditions are favourable for the transmission of *Rickettsia prowazeki*, though no large-scale outbreaks of the disease have been known to occur in recent years.

The present investigation was a preliminary to a field trial of protective inoculation by the avirulent strain of *R. prowazeki* [see this *Bulletin*, 1955, v. 52, 963]. More than 7,000 samples of serum were collected from inhabitants of Peru, most of them from the City of Arequipa in southern Peru at an altitude of about 8,000 feet, and from two rural regions, one of which is in south-central Peru at an altitude of 10,500 feet and the other in southern Peru at an altitude of 12,000 feet.

The climatic conditions ranged from cool in summer to cold in winter. Hygienic conditions in the City were good and louse infestation was not observed. In the rural areas conditions were primitive and louse infestation was high.

The initial screening was by the complement-fixation test at the low titre of 1 in 2, but even at this titre some of the non-reactors were found to have immune bodies. The findings in the above 3 areas were shown in the table:

Age-Groups	*Arequipa City*		*Rural area I*		*Rural area II*	
	Number tested	*Per cent. positive*	*Number tested*	*Per cent. positive*	*Number tested*	*Per cent. positive*
0–4	—	—	158	8	58	5
5–9	368	3	535	19	272	18
10–14	440	7	450	28	368	30
15–19	200	7	373	45	124	61
20–29	149	26	521	59	153	71
30–39	68	29	321	76	85	80
40–49			166	81	92	83
50 and over			158	80	112	77

Making allowance for the negative reactors who show evidence of immunity in the form of mouse neutralizing tests it is estimated that in the rural areas 94 per cent. of the population aged 40 years and over appear to have had benign or subclinical attacks of typhus fever in early life.

The authors discuss the significance of the findings at some length and although they admit that attempts to explain the mechanisms involved must be largely speculative they suggest that recrudescent typhus of the Brill type " must be a very common phenomenon and entirely sufficient to supply a constant and widely distributed source from which new infections are disseminated by means of the highly ubiquitous louse vector ". They point out that a partly successful attack on the louse vector with DDT might serve only to delay the average age at which attacks occur and thereby make them much more severe, as is believed to have happened with poliomyelitis. [This increase in the average age of infection and in the severity of the attacks would also be expected to occur if the permanent reservoir of infection were persons suffering from the inapparent and mild attacks in early life rather than persons with Brill's form of the disease. The latter group can readily infect body lice but there is a lack of evidence that these lice actually transmit infection to human contacts in natural conditions. If they do so it is surprising that cases of human typhus have not been reported among the many thousands of persons who have come into contact with patients suffering from Brill's disease in the crowded tenements of New York. Anyhow, it seems likely that a combination of immunization by vaccination and control of lice by DDT would be the most effective means of eliminating the chain of transmission in Peru.

The task will certainly be herculean and further progress reports will be awaited with great interest.] *John W. D. Megaw*

Eddy, G. W., Cole, M. M., Couch, M. D. & Selhime, A. **Resistance of Human Body Lice to Insecticides.** *Pub. Health Rep.* Wash. 1955, Oct., v. 70, No. 10, 1035–8. [14 refs.]

Resistance to DDT of the human body louse, *Pediculus humanus humanus*, has been reported in Korea [Hurlbut *et al.*, this *Bulletin*, 1952, v. 49, 565; Eddy, *ibid.*, 1953, v. 50, 579], Japan [Barnett and Knoblock, *ibid.*, 1952, v. 49, 654] and in Egypt [Busvine, *ibid.*, 1953, v. 50, 657; Hurlbut *et al.*, *ibid.*, 1955, v. 52, 137]. Eddy [*loc. cit.*] found lice obtained from prisoners-of-war in Korea who had had regular dusting with DDT for 6–9 months to be 100 times more resistant than a laboratory strain kept at Orlando, Florida.

The authors investigated the form of resistance of this very resistant Korean body louse to DDT and the more effective insecticides—lindane, Lauseto neu (chloromethyl *p*-chlorophenyl sulphone), pyrethrins and pyrethrins plus sulphoxide (*n*-octyl sulphoxide of isosafrole).

Resistant Korean lice maintained for 15 generations on cloth impregnated with 0·01 per cent. DDT could not be killed with 10 per cent. DDT after a 24-hour exposure. Non-resistant body lice were found to develop a very high resistance to DDT after 16 generations. Another experiment

revealed that the Korean lice could completely lose their resistance by the eighth generation when kept away from DDT.

Tests were made to see if, having lost their resistance to DDT, the Korean lice could develop some measure of resistance to lindane and Lauseto neu, by the continuous exposure to sublethal concentrations of the insecticides. After 34 generations, resistance was no more than two-fold.

Using body lice which had never been exposed to any insecticides, the authors found no significant development of resistance after 30 generations, when exposed to sublethal concentrations of pyrethrins and pyrethrins plus sulphoxide. *W. Z. Coker*

Sasa, M. **Comparative Epidemiology of Tsutsugamushi Disease in Japan (Studies on Tsutsugamushi, Part 76).** *Japanese J. Exper. Med.* 1954, Dec., v. 24, No. 6, 335–61, 17 figs. [34 refs.]

This is a report of a long lecture in which the author gave a comprehensive description of the epidemiology of tsutsugamushi disease [scrub typhus or mite typhus] with special reference to post-war work on the subject. The author mentions that he prefers the name tsutsugamushi (disease bug) to the other names given by the Japanese people to the mites of the family Trombiculidae; the other names are *kedani* (hairy mite), *akamushi* (red bug) and *shimamushi* (island bug).

In the pre-war period the mite vectors were studied almost exclusively in the north-west of Honshu Island, which was the only known focus of the disease, and all Japanese workers agreed that the sole vector was *Trombicula akamushi* Brumpt, 1910. Since the war there has been a great resurgence of interest in the disease in Japan, beginning with epidemiological studies initiated by Philip in 1947 [this *Bulletin*, 1947, v. 44, 989]. This worker, with Fuller (*Parasitology*, 1950, v. 40, 50), described *Trombicula tamiyai*. Still earlier, in 1948, tsutsugamushi disease was discovered among American troops in a new focus on the slopes of Mount Fuji. The present author, with members of his staff, in 1950–54 surveyed the mites of all the main islands of Japan and classified the Trombiculidae as belonging to 58 species.

Since 1950 three new epidemiological types of the disease have been described from various parts of Japan; each type is regarded as being transmitted by a distinct vector, as shown in the table below, in which the question marks occur in the original.

Type	*Vector*	*Season*	*Locality of endemicity*
Niigata (classical)	*T. akamushi*	Summer	N.W. Honshu Island, flooded areas. S. Asia and Pacific, scrub and jungle.
Kochi	? *T. tosa*	Summer	Kochi, Kagawa, coastal areas.

Type	*Vector*	*Season*	*Locality of endemicity*
Shichito	? *T. scutellaris*	Autumn–winter	Widespread in southern Japan in backyards, fields, forests.
Tsurumi	? *T. pallida*	Autumn–spring	Kanagawa; ? all over Japan in scrub and forests.

Two other "uncertified" types are mentioned, one suspected of being transmitted by *T. palpalis*, the other by *T. intermedia*.

The scrub typhus of the Far East is regarded as being of the same type as the classical tsutsugamushi disease of Japan.

The seasonal periods of activity of the presumptive larval vectors correspond closely with the seasonal distribution of attacks of the associated types of the disease.

The author discusses the wide range of variation in the fatality rates of the disease before the introduction of the new antibiotics; he regards the lethality of the infection as an important characteristic of the different types of the fever. *John W. D. Megaw*

Tamano, Y. **On Isolation of *Rickettsia tsutsugamushi* from the Blood of Patients in the Course of the Tsutsugamushi Disease, especially during the Afebrile Period.** *Acta Med. et Biologica.* Niigata. 1955, July, v. 3, No. 2, 173–91, 4 figs. [19 refs.]

The author describes the results obtained in attempts to isolate *Rickettsia tsutsugamushi* from the blood of patients who had been experimentally inoculated with the organism and treated with antibiotics 3–10 days after the onset of the resultant fever. The method of isolation was the intraperitoneal inoculation of mice.

The rickettsiae could be isolated 2–3 days before the onset of the fever and 2–4 days after defervescence following antibiotic treatment. When the fever yielded rapidly to treatment the rickettsiae disappeared from the blood 1–2 days earlier than when the response to treatment was slow. In cases of relapse after treatment rickettsiae could again be isolated up to 2–4 days after the fall of temperature.

When patients had recovered from attacks caused by inoculation and were reinoculated, rickettsiae could sometimes be isolated up to a week after reinoculation, even when no fever occurred.

The blood of each of 12 recovered patients, who had been inoculated 35–450 days previously, was inoculated into persons who had never had tsutsugamushi disease; no symptoms resulted in any of these persons.

Four patients were reinoculated 224–408 days after their original inoculation, but none developed any symptoms. From 50 to 100 cc. of the blood of each of these reinoculated persons was transfused into persons who had never had tsutsugamushi disease; 2 of the transfused persons remained free from symptoms, the other 2 developed attacks

10 days after transfusion; one of them had received 100 cc. of blood taken from a patient 27 days after his reinoculation; the other had received 50 cc. from a patient 24 days after reinoculation. *John W. D. Megaw*

KURASHIMA, R. **The Therapeutic Power of Antibiotics in experimentally-caused Tsutsugamushi Disease in Mice.** *Acta Med. et Biologica.* Niigata. 1955, July, v. 3, No. 2, 159–72, 4 figs. [21 refs.]

This is said to be a detailed explanation of a part of Professor S. KATSURA's special report on the chemotherapy of tsutsugamushi disease. It contains a detailed description of tests on mice to determine the rickettsiacidal and therapeutic activity of the antibiotics employed in the treatment of rickettsial diseases. As might be expected the rickettsiocidal power of the drugs is described as being rather weak.

Professor Katsura has incorporated in his report the significant results of the tests [see this *Bulletin*, 1956, v. 53, 302]. *John W. D. Megaw*

KAWAMURA, A., Jr.; TSUNEMATSU, Y.; NISHIOKA, K.; YAMANÈ, K.; SAITO, M.; KAWAI, K.; HAYASHI, H.; NAKAMURA, K.; KOMINE, I. **Studies on *Rickettsia tamiyai*. I. Biological Characters of *Rickettsia tamiyai*** [KAWAMURA, TSUNEMATSU, NISHIOKA, YAMANÈ & SAITO]. *Japanese J. Exper. Med.* 1954, Dec., v. 24, No. 6, 385–92, 5 figs. on pl. [15 refs.] **II. On the Experimental Infection of Monkey. With Pathologic-Anatomical Descriptions on a Fatal Case** [KAWAMURA, YAMANÈ & KAWAI]. *Ibid.*, 393–403, 15 figs. (12 on 3 pls.). [14 refs.] **III. A Report on a Case of Rickettsiosis experimentally infected with** *R. tamiyai* [HAYASHI, NAKAMURA, KOMINE & KAWAMURA]. *Ibid.*, 405–9, 1 fig. [10 refs.]

These studies consist of 3 papers in which Kawamura *et al.* give detailed descriptions of a rickettsia which is referred to as a "strain" differing from every known rickettsia, including even *Rickettsia orientalis* [*R. tsutsugamushi*]. The name proposed was *Rickettsia tamiyai* Kawamura, 1954 [see this *Bulletin*, 1955, v. 52, 622].

The chief features relied on for differentiating the organism from *R. tsutsugamushi* are:—the absence of an eschar at the site of intracutaneous inoculation of animals; the agglutination of *Proteus OX2*, at the same high titre as *Pr. OXK*, by sera of experimental animals; and the specificity of the complement-fixing antibodies in the sera of these animals.

Cross-immunity tests on mice immunized by the strain showed that 7 of 10 mice protected survived challenge with the homologous strain, whereas only 2 of 10 mice immunized by a Japanese strain of *R. orientalis* survived challenge by the new strain.

In the 2nd paper the effects of inoculation of monkeys with the strain are described. A rhesus monkey inoculated with *R. tamiyai* developed an illness very similar to that produced in a Japanese monkey inoculated with *R. orientalis* except for the differences just mentioned. A Japanese monkey inoculated with *R. tamiyai* died 11 days after inoculation and was subjected to a detailed histopathological study. No definite eschar was found, but at the site of inoculation the subcutaneous tissues were in a state of coagulation necrosis similar to that occurring under eschars. The blood vessels of the necrotic region showed changes in the endothelium and walls of the vessels similar to those found in rickettsial diseases, but no other vessels of the body were affected in this way.

The other changes found in the tissues resembled those produced by *R. orientalis* more than those caused by any other rickettsial infection. In the 3rd paper a report is given of the illness of a human volunteer inoculated with *R. tamiyai*. The attack is stated to have been a human rickettsiosis closely resembling tsutsugamushi disease. The response to treatment with oxytetracycline [Terramycin] was slow in spite of the large dose amounting to 9·25 gm. given between the 8th and 13th day.

The Weil-Felix and complement-fixation responses were similar to those produced in experimental animals.

[The strain seems to have been different in some respects from the other strains tested but it may be doubted whether these differences justify its promotion to the rank of a species.] *John W. D. Megaw*

Hoeprich, P. D., Kent, G. T. & Dingle, J. H. **Rickettsialpox: Report of a Serologically Proved Case in Cleveland.** *New England J. of Med.* 1956, Jan. 5, v. 254, No. 1, 25–7. [17 refs.]

Juarez, E. Consideraciones subre cinco casos de fiebre exantemática mediterránea tratados con aureomicina. [**A Note on 5 Cases of Mediterranean Exanthematic Fever treated with Aureomycin (Chlortetracycline)** *Rev. Sanidad y Hig. Pública.* Madrid. 1955, May–June, v. 29, Nos. 5/6, 238–42.

A brief description is given of 5 cases of the form of tick-borne typhus fever which is variously called boutonneuse fever, escharo-nodular fever, Olmer's fever, summer exanthematic fever, and Mediterranean exanthematic fever. The diagnosis was not confirmed by serological tests, but the clinical and epidemiological features of the cases were sufficiently characteristic to justify a confident diagnosis.

Four of the patients were treated with chlortetracycline; in 2 cases the total dosage was 1·0 gm. given in doses of 0·25 gm. every 6 hours; in the other 2 the total dose was 2·0 gm. given in doses of 0·50 gm. every

6 hours. Treatment was started about the 4th or 5th day and there was a prompt response to the drug in each case.

The 5th patient received Terramycin [oxytetracycline]; the total dosage was 2·0 gm. given at the rate of 0·50 gm. every 6 hours from about the 7th day of the fever; the result was equally satisfactory.

There was an inoculation eschar in every case but the author states that this lesion was absent in a high percentage of the other patients seen by him. He also states that the disease is far more common than is generally known in many parts of Spain. Medical men are often unaware of the existence of the disease in their regions. The present cases occurred during the summer of 1954 in the Province of Cáceres in Spain, far inland from the Mediterranean. *John W. D. Megaw*

McCroan, J. E., Ramsey, R. L., Murphy, W. J. & Dick, Lillian S. **The Status of Rocky Mountain Spotted Fever in the Southeastern United States.** *Pub. Health Rep.* Wash. 1955, Mar., v. 70, No. 3, 319–25. [21 refs.]

The status of Rocky Mountain spotted fever in the south-eastern States of the U.S.A. is shown to be very different from what it was supposed to be a few years ago. During the years 1939–1946, 1,308 cases with a case-fatality rate of 20·98 per cent. were reported from the 3 most heavily affected of these States, compared with 683 cases having almost the same fatality rate of 21·5 per cent. in the 3 most heavily affected western States.

During 1949–1953 half of all the cases of the disease reported from the U.S.A. occurred in the 10 south-eastern States.

The status of murine typhus in these States has also undergone a dramatic change. In the years 1951–1953, instead of having an almost complete monopoly of this disease, the south-eastern States have had only about one-half of the number of cases reported in the U.S.A. In the State of Georgia 1,256 cases were reported in 1943 and only 41 in 1953.

Since 1952 fewer cases of "endemic" [flea-borne] typhus than of Rocky Mountain spotted fever have been reported from the south-eastern States; but since the introduction of the broad-spectrum antibiotics the differential diagnosis of these diseases has become more difficult because these drugs "influence the appearance of the Weil-Felix and complement-fixing antibodies". An example of this difficulty is given: "Five of the nine cases of Rocky Mountain spotted fever confirmed [in Georgia] in 1953 were originally reported as typhus". It appears that *Proteus OX19* is the only strain employed in the Weil-Felix test.

Control of ticks on the roadsides and paths has been found so easy with insecticides like DDT that it has become practicable in areas of high prevalence of Rocky Mountain spotted fever and even in places where the tick is only a nuisance. *John W. D. Megaw*

Kaplan, M. M. & Bertagna, P. **The Geographical Distribution of Q Fever.** *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 5, 829–60. [210 refs.]

This is a detailed and fully documented description of the known geographical distribution of Q fever. A great deal of information on this subject has been acquired from recent surveys which have been carried out in 32 countries with the assistance of the World Health Organization.

The tests recommended to workers who have carried out these assisted surveys were: (1) complement-fixation tests of workers in abattoirs and fat-rendering plants; (2) inoculation of guineapigs with milk samples pooled from 100–200 animals, with pre-inoculation and post-inoculation complement-fixation tests of the guineapigs; and (3) random complement-fixation tests of individual animals.

Q fever is now known to occur in 51 countries and the only countries in which a serious search has failed to result in the discovery of the disease are Ireland, Holland, Poland, Sweden, Norway, Finland and New Zealand.

In countries from which the disease could safely be excluded there was a remarkable rarity of false positive reactions; for example, in Holland there was only one among 3,200 sera tested. These findings suggest that the fixation test has a high degree of specificity.

The bibliography contains references to 182 published articles and to 28 special communications to WHO; the information provided in these is summarized in a table which contains reference numbers indicating the various sources from which the whole has been compiled.

John W. D. Megaw

Monthly Bull. Ministry of Health & Pub. Health Lab. Service (Directed by Med. Res. Council). 1956, Jan., v. 15, 10–17, 2 figs. **An Outbreak of Q Fever in a Rural District of Central Wales. A Report to the Public Health Laboratory Service.**

This is an unsigned report to the Public Health Laboratory Service of an investigation of an outbreak of Q fever in which 13 men and 2 women, whose ages ranged from 24 to 77 years, were attacked in a rural area of Cardiganshire, in central Wales, between May 11 and June 7, 1953.

The area is about 3 by 2 miles in size; it consists mostly of sheep farms in very hilly country. The flocks of sheep varied in numbers from 125 to 1,200. In 13 cases the attacks were typical, with fever lasting 7–14 days, usually accompanied by severe headache and profuse sweating. In 3 of the 13 definitely diagnosed cases there was a four-fold or greater rise in the complement-fixation titre during the illness; in the other 10, in which the tests were made during convalescence, the titres were: 1 in 40 (in 1); 1 in 80 (in 2); and " 1/80 or greater " (in 7).

Infection must have occurred during the lambing period; its irregular distribution in place and time suggested either a single source of sustained

infectivity or different sources which became infective during a short period. Ten of the patients had been in contact with sheep in the area; in the others there was no evidence of such contact.

Five flocks of sheep were selected for examination on farms where there had been cases of the disease among the farm workers. Altogether 317 sheep were tested and in every flock at least one sheep gave a positive complement-fixation reaction at 1 in 20. The percentages of positive reactions at 1 in 10 or over in the 5 flocks ranged from 1·2 to 5·6, the average being 3·5. Among 121 sheep not associated with cases of Q fever only 1 reacted, at 1 in 20.

The centrifuged deposit of milk from 73 ewes belonging to flocks associated with the occurrence of cases was inoculated into guineapigs but *R. burneti* was not isolated.

In the comment it is stated that " In spite of these investigations the source and mode of spread of infection in the outbreak remained somewhat obscure ". This seems to be an unduly pessimistic view of the results of the enquiry. Definite proof is seldom possible in connexion with outbreaks of the kind, but there is strong evidence of an association between the occurrence of infection among the sheep and the transmission of the disease to those patients who came into close contact with the flocks at the time of lambing. The alternative explanation offered, that both man and sheep may have been infected by the ticks *Ixodes ricinus*, is improbable in view of the negative history of tick bite and the failure to isolate *R. burneti* from the 900 *I. ricinus* collected on the farms in which cases occurred.

No mention is made of the possibility of infection by the inhalation of infected dust; this has been the probable mode of transmission in several outbreaks in Italy, Switzerland and America in which there was no direct contact with infected animals. Presumably the weather conditions were not favourable for air-borne infection in the present outbreak, otherwise this might have deserved consideration in connexion with the few cases in which immediate contact with the sheep was excluded.

The report is of considerable interest and deserves wide circulation. The investigation was very thorough; the names are given of 14 workers who participated in it " to a greater or lesser extent ". They included Drs. B. P. Marmion, M. G. P. Stoker and G. Slavin: see also this *Bulletin*, 1956, v. 53, 171, 172. *John W. D. Megaw*

Wiesmann, E., Schweizer, R. & Tobler, H. Q-Fieber in der Nordostschweiz. Eine epidemiologische Studie aus dem Winter 1954/55. [**Q Fever in North-Eastern Switzerland. Epidemiological Study in the Winter of 1954–55**] *Schweiz. med. Woch.* 1956, Jan. 21, v. 86, No. 3, 60–63, 5 figs. [16 refs.]

In the Bacteriological Institute of the Canton St. Gallen 1,730 cases of Q fever were diagnosed between August 1947 and August 1955. The

average monthly rate of incidence for each period of 12 months ranged between 6 and 53. The present paper deals specially with the period November 1954 to March 31, 1955. In November there were 6 cases, in December there were 113 and in the next 3 months the numbers were 45, 27 and 27.

Outbreaks occurred in several scattered foci in the Canton of St. Gallen, which is situated south of Lake Constance, and most of the patients had had contact, directly or indirectly, with flocks of sheep. In 3 outbreaks 51 sheep were examined and 38 were found positive with the complement-fixation reaction at titres of 1 in 10 to 1 in 80. Rickettsiae were isolated from the blood of 2 sheep. From the urine of 39 sheep 4 strains of *R. burneti* were isolated. In one outbreak a group of 6 persons were attacked at the same time, 8 to 14 days after having been employed in the reconstruction of an old cesspool containing the urine from 16 cows.

A very interesting outbreak occurred in a factory in which 120 persons were employed. Among 59 males 22 gave positive complement-fixation reactions and among 57 females 20 were positive; the titres ranged from 1 in 20 to 1 in 320 or over. The factory and the workers' quarters were situated round a field in which 9 sheep were grazing. Sera of 8 of the sheep gave positive reactions at titres of 1 in 10 to 1 in 80. Among the 42 persons who had positive reactions 26 had recently suffered from an illness which had been regarded as influenza; the other 16 gave no history of recent illness. Special importance is attached to the excretion of *R. burneti* in the urine of apparently healthy sheep and to the possible spread of infection to persons who inhale dust derived from material contaminated with the infected urine and then dried during spells of fine weather. Evidence is quoted which suggests that infected sheep and goats are specially liable to abortion and that careful observation of the animals would often lead to the detection of signs of illness among them; hence the desirability of close collaboration between medical and veterinary practitioners. *John W. D. Megaw*

Gutfreund, R., Gelberg, V. & Chabaud, M. A. Enquête préliminaire sur la fièvre Q en Éthiopie. [**A Preliminary Study of Q Fever in Ethiopia**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 4, 451–3.

During the years 1953–54 the following results were obtained with the rickettsial micro-agglutination test for Q fever in the Addis Ababa region.

Number tested	*Percentage positive*	*Range of titres*
12 men (abattoir of Addis Ababa)	2 men positive	1 in 10 to 1 in 20
514 peasants (neighbouring provinces)	5·8	1 in 10 to 1 in 80
173 zebu cattle	4·0	1 in 10 to 1 in 40
248 sheep	9·27	1 in 10 to 1 in 320
236 goats	15·12	1 in 10 to 1 in 2,500

Attempts were made, without success, to isolate *Rickettsia burneti* from the blood of 2 human and 12 animal reactors by intraperitoneal inoculation of guineapigs. Numerous tick suspensions were also inoculated without success. This is the first time that Q fever infection has been reported from Abyssinia. *John W. D. Megaw*

Stoker, M. G. P. & Marmion, B. P. **The Spread of Q Fever from Animals to Man. The Natural History of a Rickettsial Disease.** *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 5, 781–806. [123 refs.]

This article will be greatly appreciated by every worker who is concerned with the knotty problems connected with the transmission of Q fever. The purpose of the paper is " to consider the behaviour of *R. burneti* in its natural hosts, and, by relating one with another, to discuss the maintenance of a permanent reservoir of the organism in nature and the spread of infection to man ". The proved natural hosts of *R. burneti* are stated as being: (1) man; (2) 22 species of ticks; (3) the body louse; (4) 8 different mammals; and (5) a pigeon.

A list is given of the ticks found naturally infected and, when known, of the hosts from which they have been collected. A list is also given of 7 of these ticks which have been experimentally infected by feeding on mammalian hosts, and of 10 other ticks which have been experimentally infected though never found infected in natural conditions.

In spite of the great store of knowledge of Q fever that has been collected by observation and experiment, the disease in many respects lives up to its name Q(uery) fever. A considerable part of the present paper is taken up with a discussion of some of the questionable features; for example, to what extent is *R. burneti* maintained by continuous transmission from tick to tick through the ovum? This process is not regarded as being important in natural conditions in view of the difficulty of demonstrating its occurrence by experiment. Infection of the tick is believed to occur chiefly by feeding on infected hosts. Another problem is stated by the authors in these words: " But although ticks from many countries are known to harbour *R. burneti*, little is known of the efficiency of ticks as vectors under natural conditions ". The extent to which infection is maintained among wild and domestic animals by tick transmission as compared to transmission by direct contact is not known. Nor is it known whether—and if so to what extent—infection among domestic animals is maintained by transmission to them from wild animals, either directly or through the intervention of ticks.

One thing is clear, transmission to man is usually by contact with domestic animals, rarely by the bite of a tick; and infected persons are seldom infective to those who come into contact with them, though occasions have been reported in which patients have transmitted infection by droplets of infected sputum.

The authors diversify their summary of the literature by some interesting suggestions, some of which are speculative; for example they ask: " What are the chances that *R. burneti* will eventually produce a variant that can spread effectively between humans ", and suggest that it might become further adapted to growth in the human louse.

John W. D. Megaw

Stoker, M. G. P., Page, Zoe & Marmion, B. P. **Problems in the Diagnosis of Q Fever by Complement-Fixation Tests.** *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 5, 807–27, 5 figs. [31 refs.]

At first sight this paper may cause some disillusionment among laboratory workers who carry out the complement-fixation test for Q fever and among physicians who have to interpret the reports of the findings.

The authors have employed technical methods which are necessarily elaborate in a critcal study of the merits and defects of the test as usually carried out. They show that the correct antigen dilution must be found by " chess-board " titration with various antisera; that non-specific reactions may occur in cases of primary atypical pneumonia or in sera which have been stored for a considerable time at room temperature, and that the two antigens in common use may give very different results. The Nine-Mile antigen was found more sensitive than the Henzerling with the human sera tested and with sheep sera from most areas; but with sheep sera from one area the latter test was the more sensitive. The authors point out, however, that for clinical diagnosis it is the occurrence of a rising-titre reaction rather than a quantitative estimate of the highest titre which is needed, and they conclude that either of the two antigens will usually give satisfactory results. An interesting point was that the few tests made with the rickettsia-agglutination reaction did not " necessarily show the differences between the Nine Mile and Henzerling strain antigens ".

John W. D. Megaw

Özbil. M. Ein Beitrag zur Frage der Rickettsienausscheidung mit dem Urin. [**A Contribution on the Subject of the Excretion of Rickettsiae in the Urine**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Dec., v. 6, No. 4, 453–9. [12 refs.]

Experiments are described in which *Coxiella* [*Rickettsia*] *burneti* was isolated from the urine of white mice inoculated intraperitoneally with the organism. Rickettsiae were present from the 3rd day after inoculation to at least the 16th day.

In suspensions of the tissues of infected animals made in sterile urine the rickettsiae remained viable for 48 hours at room temperature. In

corresponding experiments with suspensions of *Rickettsia prowazeki* and *R. mooseri* the organisms did not remain viable for more than 60–90 minutes.

The technical methods employed are described fully; they included the inoculation of white mice or guineapigs by the intraperitoneal and intranasal routes and the intrarectal inoculation of human lice by Weigl's method.

The literature of the subject is reviewed and the conclusion is reached that animals infected with Q fever are likely to transmit infection by contamination of food and drink with infected urine, or transmission may occur by the inhalation of dust particles originating from materials which have been contaminated by the urine of infected animals and then dried.

The transmission of infection with the other rickettsiae in these ways is considered to be very unlikely. [For work on the possible transmission of murine typhus by the urine of rats, see this *Bulletin*, 1938, v. 35, 782; 1939, v. 36, 994.] *John W. D. Megaw*

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

Teesdale, C. **Studies on the Bionomics of** *Aëdes aegypti* **(L.) in its Natural Habitats in a Coastal Region of Kenya.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 711–42, 4 figs. on pl. & 8 text figs. [42 refs.]

The investigations described in this paper were carried out at 3 closely-settled localities near Mombasa, where the rectangular mud-walled and palm-thatched houses are scattered among mixed plantations of mango, cashew-nut and coconut trees. The plantations form a dense, discontinuous canopy, with a lower-storey level supplied by groups of banana, cassava and pineapple plants. The ground vegetation consists of low-growing bush and grass on a mainly sandy, porous soil but with occasional patches of shale which become shallow temporary swamps during and after the rains. The climate of the area is typical of the coastal zone of East Africa, influenced by both the north-east and south-west monsoons. Seasonal variations in temperature and humidity are comparatively slight.

The duration of larval life of *Aëdes aegypti* in the natural environment was found to be from 8 to 25 days, with a tendency for larvae hatched from conditioned eggs to complete development a little sooner than those from unconditioned eggs.

A preponderance of males over females was noticed (17 to 10) among

eggs hatched in natural habitats, although in catches of adult mosquitoes females always predominated.

The results of an investigation into flight and dispersion from breeding areas are thought to indicate a short flight range, which nevertheless achieves thorough dispersion.

The results of experiments with water containers placed in trees show that although eggs may be laid up to a height of 70 ft. or so, the normal flight is near the ground.

A large section of the paper is devoted to a discussion of the results of window-trap catches; it is demonstrated that both sexes enter and leave African houses. This movement, in either direction, takes place chiefly during the hours of daylight, and the peak entry of males is between 9 a.m. and 1 p.m.—the time when fewest females enter. Both sexes leave houses chiefly at two peak periods: 7–8 a.m. and 4–7 p.m. Flight out of houses is minimal in the cool months of July and August; correspondingly, this is the time of maximal entry.

The reduced number of adults and larvae found indoors in the hot months of February and March is attributed to a combination of the absence of exterior breeding places at this time, and a shorter duration of life.

Adults entering houses are thought to do so mainly for shelter: it is shown that entry is unlikely to be connected primarily with either feeding, mating, or oviposition; although a small, but significant, proportion of females undoubtedly oviposit indoors in the dry season.

The biting-cycle is considered, and it is seen that although *Aëdes aegypti* will bite both by day and night, and indoors and out, biting is preponderantly diurnal, with a minor peak between 10 a.m. and 1 p.m., and a major peak between 4 p.m. and 7 p.m. The main (evening) peak corresponds to the maximum of flight activity into and out of houses, and is perhaps part of a general activity rhythm. Shade conditions are preferred for biting, but the mosquito will do so in bright sunlight. Further, it appears possible that only females hatched indoors will normally bite indoors.

Most of the females entering African huts have immature ovaries, while most of those leaving do so with matured ovaries. There is some evidence indicating that pairing generally occurs only after the female has fed.

Precipitin tests of stomach contents on a limited scale indicate the existence of an (as yet unknown) important host other than man, but not included among the commoner domestic animals. It is suggested that there are grounds for supposing that this host may be found among the lizards common in the area.

The rôle of *Aëdes aegypti* as a possible vector of yellow fever on the Kenya coast is briefly discussed, and some comments are given on local control methods. *D. M. Minter*

Bradley, G. H. & Atchley, F. O. **The *Aëdes aegypti* Situation in the United States.** *Bol. Oficina Sanitaria Panamericana.* 1955, Mar., v. 38, No. 3, 289–92, 1 map.

Aëdes aegypti has been reported throughout an area in the U.S.A. south of a line roughly drawn from Southern Virginia west to Northern Oklahoma and then south-west to the United States border at El Paso, Texas. This line is just north of the 60° isotherm. *A. aegypti* is also reported further west on the Mexican border at Tucson, Arizona, and Carlsbad, New Mexico, but has not been recorded on the Pacific Coast of the U.S.A. Yellow fever has not occurred since an outbreak in 1905 at New Orleans and dengue has been infrequent in recent years. During World War II attempts were made to reduce the population of *A. aegypti*. The only attempt to eradicate the mosquito was made at Key West, Florida, and this was continued after the war. The species is now reported here as absent for two seasons. In 1952 a survey of 16 towns in which wartime programmes were conducted showed an increase in 4 towns (comparing an index of percentage of premises infested), a decrease in 10 and a similar population in 2 towns. No breeding was recorded in 6 towns. In 12 other towns where no comparable observations were available for previous years only one (index 11·3 per cent.) had more than 5 per cent. of premises infested and no *A. aegypti* were recorded from 5 towns. *A. aegypti* is considered to be still a common and widespread species in the south-eastern United States.

B. R. Laurence

Macnamara, F. N. **Yellow Fever Vaccines, a Consideration of Different Types and their Field Trials.** *West African Med. J.* 1955, Sept., v. 4, No. 3, 124–9. [13 refs.]

Because of the existence of the forest (lower-animal–mosquito) cycle of yellow fever in West Africa, where wholly effective measures against the forest vectors are not possible and where the animal hosts of the virus cannot be eliminated, vaccination must, for a long time to come, continue to play the leading role in the control of the disease there. Although highly satisfactory vaccines are already available in quantity, and their use provides the means of protecting communities exposed to the sylvan disease, there is still need for further research into the production and methods of administration of these vaccines so that they may be used in mass vaccination campaigns with a maximum of efficiency and at a minimum of cost.

In this connexion the fact that the two strains of yellow fever virus currently employed for the preparation of vaccines—the French neurotropic and the 17D—may be grown in mouse brains or in embryonated hen eggs and may be administered as vaccines by scarification or subcutaneous injection permits 8 different combinations of strains, production, and methods of administration to be envisaged. In the present

article these combinations are discussed with respect to their efficiency, ease of administration, production, safety and cost. One of the combinations is now for the first time being tested by the Federal Laboratory Service of Nigeria, namely, a vaccine prepared from the 17D strain grown in mouse brain and administered by scarification. The seed of this vaccine invariably derives from egg material and inoculations of the mice are made from limiting dilutions.

Whatever its mode of preparation, the final test of a vaccine must depend on its success as an immunizing agent in the field; and in the assessment of a vaccine, the advantage of having serological surveys made on a community before and after a vaccination campaign is obvious. A method for calculating the result of such a campaign is given in the paper.

[In 1952 Dick (this *Bulletin*, 1952, v. 49, 685) suggested that by using 17D mouse-brain virus a preparation of 17D vaccine could be administered by scarification which " might prove to be a satisfactory method of mass vaccination of persons living in endemic yellow fever areas. . . . The use of such a preparation would reduce the cost of the vaccine, and the dispensing with syringes would facilitate mass vaccinations and reduce the chance of the syringe transmission of disease ".] *G. Stuart*

See also p. 505, Elliott, **Larvicidal Control of Peridomestic Mosquitoes.**

See also p. 674, Wharton, **The Susceptibility of Various Species of Mosquitos to DDT, Dieldrin and BHC.**

RABIES

Donatien, A., Poul, J. & Rampon, R. Titrage de la virulence du virus rabique sur le chien. [**Titration of the Virulence of Rabies Virus in the Dog**] *Arch. Inst. Pasteur d'Algérie.* 1955, Sept., v. 33, No. 3, 237–42.

The virulence of rabies virus is ordinarily determined by intracerebral titration in mice or in rabbits. The present article records the results of investigations made in Algeria between 1952 and 1954 with a view to ascertaining whether such virulence may be similarly determined in dogs.

In these investigations the Tangier strain of fixed virus maintained solely in the rabbit was employed and in each of the 12 titration experiments carried out 25 dogs, arranged in groups of 5, were inoculated intracerebrally, each group receiving 0·4 ml. of a 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} or 10^{-6} dilution of the virus.

The results of these experiments showed the titre at which 50 per cent. of the animals died to vary between 10^{-4} and 10^{-5}, irrespective of the animals' breed, age, sex or weight.

From these results, proof of the statistical significance of which is convincingly advanced in the paper, the authors conclude that in Algeria the dog is an animal in which not only titration of the virulence of rabies virus but also, therefore, the potency testing of anti-rabies vaccines prepared for canine prophylaxis can readily be effected. In Algeria, where dogs constitute 87·70 per cent. of the biting animals and where rabies control measures include vaccination of the entire dog population, the advantage of being able to test on dogs themselves the efficacy of vaccines destined for canine prophylaxis requires no emphasis.

G. Stuart

Remlinger, P. & Hadji, A. Le virus rabique Flury chez le lapin. [**The Flury Strain of Rabies Virus and its Pathogenicity for the Rabbit**] *Arch. Inst. Pasteur d'Algérie*. 1955, Sept., v. 33, No. 3, 226–32.

This article records the results of experimental work carried out by the authors between 1952 and 1955 on a sample of Flury virus received in April 1952 from the Lederle Laboratories, New York. The object of the investigations was to determine whether repeated passage of this virus in the same species of animal would result in its fixation, as evidenced by, *inter alia*, the regularity of the symptomatology and the exclusively paralytic form of the disease it produced.

The first series of experiments showed the rabbit to be too resistant to intracerebral inoculation of the virus to be suitable for passage purposes. Thus of 50 rabbits so inoculated 25 resisted infection and 20 developed epileptiform attacks, mostly of a benign character, while 3 died of paralytic rabies and 2 of an atypical form of that disease. In only one instance was the rabic nature of the epileptiform attacks proved by subsequent animal passage. In further experiments serial brain-to-brain passage of the virus was found to be readily effected in guineapigs, and brain material from these animals at earlier and later passage levels was then inoculated intracerebrally into a second and a third series of rabbits, respectively. Of the 40 rabbits in the second series 5 resisted infection, 20 developed epileptiform attacks from which 3 recovered, and 15 died after showing signs of paresis, cachexia, drowsiness or other atypical forms of the disease. In this series proof of rabies was established by animal passage in 12 cases (30 per cent.). In the third series, in which 21 rabbits were inoculated with the virus after its 34th to 36th passage in guineapigs, one resisted infection and one succumbed to paralytic rabies, while 19 developed epileptiform attacks of a violent character and died. Brain material from 14 of the last-mentioned 19 rabbits proved, on

animal passage, to be positive for rabies in 11 cases (78·57 per cent.), thus confirming the rabic nature of the epileptiform attacks.

From these results it is apparent that early passages of the Flury strain in guineapigs led to its producing in the rabbit a great diversity of clinical forms of rabies and later passages to a marked increase in the number, violence and gravity of the epileptiform attacks which, appearing after an incubation period of 8–11 (mostly 9–10) days, are said to characterize the Flury virus. It is also apparent that the virus, when " fixed " for the guineapig, failed to produce in the rabbit the exclusively paralytic form of rabies in all but an insignificant number of cases. That the Flury virus is not, however, a pararabies virus or a virus B is amply demonstrated by cross-immunity tests. It forms part of a complete antigenic community, to which other strains differing widely in individual character belong.

The article concludes with a number of observations on the use of the Flury virus in vaccines prepared for the prophylaxis of animals against rabies and with the recommendation that a meeting of rabiologists be convened to consider the practical value of the virus in this respect.

G. Stuart

Eads, R. B., Wiseman, J. S., Grimes, J. E. & Menzies, G. C. **Wildlife Rabies in Texas—a Preliminary Report.** *Pub. Health Rep.* Wash. 1955, Oct., v. 70, No. 10, 995–1000, 4 figs. [12 refs.]

In Texas rabies is prevalent among wild animal populations and in recent years it has occurred in epizootic proportions among foxes and skunks [this *Bulletin*, 1955, v. 52, 268]. In this connexion the fact that in Texas the rabies virus had repeatedly been recovered from the Mexican free-tailed bat, *Tadarida mexicana*, and that this species of bat is the most abundant and widespread in the State, led to an investigation of the role these bats might play there in the maintenance and spread of the disease.

Regular observations between May 1954 and April 1955 of the very large bat colony in Bracken Cave near San Antonio revealed a high level of rabies infection among the Mexican free-tailed bats, the virus being isolated during that period in 12 out of 98 pools containing 329 bats of this species. It was also observed that predatory animals, particularly raccoons, were far more abundant round the study cave than the food supply appeared to justify, unless they were feeding on bats. In November 1954 and again in April 1955 positive evidence of raccoons eating bats in numbers was obtained and it seemed probable that the presence of rabies in the bat colony had caused infected bats to fall to the ground in a moribund condition, thereby serving as food for the raccoons.

This relationship provides a hypothetical explanation of the way in which rabies might pass from bats to raccoons, and evidence from the

literature suggests the possibility of similar transfer to ringtailed cats, skunks, oppossums and other animals. The mechanism of transfer has not, however, been found, but is still being investigated. *G. Stuart*

Burns, K. F., Farinacci, C. J. & Murnane, T. G. **Rabies in Insectivorous Bats of Texas.** *J. Amer. Vet. Med. Ass.* 1956, Jan. 1, v. 128, No. 1, 27–31. [16 refs.]

"1) Rabies was found in insectivorous bats (*Tadarida mexicana*) in Texas.

"2) The isolation and identification of nine strains of rabies virus from the brains of Mexican free-tailed bats during 1954 is reported.

"3) Neutralization tests performed in mice on serums of normal healthy bats as well as symptomatic bats revealed the presence of neutralizing antibody for the virus of rabies in a large percentage of specimens.

"4) Accumulative evidence would suggest that insectivorous bats may play an important role as a reservoir for sylvatic rabies in Texas, resulting in the occasional infection of man."

Bell, J. F., Hadlow, W. J. & Jellison, W. L. **Chiropteran Rabies in Montana.** *Pub. Health Rep.* Wash. 1955, Oct., v. 70, No. 10, 991–4, 1 fig.

In August 1954 rabies virus was isolated at Montana from the brain of a bat identified as *Eptesicus fuscus pallidus*, an insectivorous species indigenous to the western United States. On histological examination typical Negri bodies were found in the brain of the bat and in the brains of first and second passage mice. The incubation period of the disease in mice was prolonged (about 16 days) in first passage, but became shorter in serial passage (7 days in fourth-passage mice). A virus titre of 10^3 LD50/0·03 ml. was present in the original bat-brain suspension.

Identification of the virus was established by neutralization and protection tests with known anti-rabies serum, and by cross-protection tests with vaccines prepared from the bat virus and from fixed rabies virus. Results of vaccine protection tests on mice clearly indicated that both vaccines afforded significant protection against homologous and heterologous challenge.

This is the first reported isolation of rabies virus from the insectivorous bat *Eptesicus fuscus pallidus* and is the northernmost isolation from any species of bat. In view of the fact that *E. f. pallidus* is not known to migrate and that it hibernates in caves in the northern States, the source of infection in the specimen investigated is at present conjectural.

G. Stuart

Ninomiya, S. **Histopathological Studies on the Salivary Glands of Rabic Dogs, with special reference to the Parotid and Mandibular Glands. With an Appendix on Cervical Lymph Nodes.** *Gunma J. Med. Sci.* Maebashi. 1955, July, v. 4, No. 2, 117–27, 8 figs. [16 refs.]

Between June and September 1950 the author carried out histopathological examinations on the parotid and submaxillary glands of 15 dogs, in which a diagnosis of rabies had been confirmed.

Macroscopically, neither parotid nor submaxillary glands revealed any noteworthy changes, although in the latter slight hyperaemia and a moderate degree of swelling were occasionally observed.

On histological examination, lesions were seen to be slight in the parotid, but pronounced in the submaxillary. In the parotid, the parenchyma was oedematous, the epithelial cells of the serous alveoli were to some extent atrophied, and the acini and glandular cavities, generally, were shrunken; in the stroma there was little or no inflammatory cell infiltration; the microganglia and nerve fibres in the stroma were not noticeably affected. In the submaxillary, marked degeneration and destruction of the epithelium in the mucous alveoli and extensive, diffuse or focal, inflammatory cell infiltration of the stroma, with accompanying proliferation of histiocytes, were the most important pathological processes. In the crescents (of Gianuzzi)—groups of cells, serous in type and function—lying within many mucous alveoli, there was swelling of the crescents and degeneration of their epithelium. No changes in nerve cells or in nerve fibres in the interlobular connective tissues were observed.

In the author's view the lesions in the epithelium of the submaxillary glands are "parenchymal inflammation due to the direct action of the virus". The inflammatory cell invasion of the stroma, with accompanying proliferation of histiocytes, can be considered a direct as well as an indirect response to the virus. The atrophy of cells and the oedema seen in the parotid result from acute malnutrition occasioned by the severity of an illness of short duration.

Cervical lymph nodes adjacent to the submaxillary glands showing lesions of the nature indicated above were also examined. Macroscopically swollen and hyperaemic, they showed, on histological examination, swelling and hyperplasia of the reticuloendothelial cells, with resultant atrophy of lymph follicles. These findings were regarded as evidence of the direct or indirect response to infection with the virus. *G. Stuart*

Welsh, M. Estado actual del problema de la vacunación con vacuna avianizada Flury. [**The Present Status of the Problem of Vaccination with Flury Avianized Vaccine**] *Bol. Oficina Sanitaria Panamericana.* 1955, Oct., v. 39, No. 4, 357–64. [18 refs.] English summary.

Hasegawa, S., Nagano, Y., Kitamoto, O., Otani, S. & Shibuki, M. Récent essai au Japon d'un vaccin antirabique irradié. [**Recent trial in Japan of an Irradiated Anti-Rabies Vaccine**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 21/22, 368–9.

In this article the authors describe their method of preparing vaccine irradiated by ultraviolet light from the Pasteur Institute strain of fixed virus, show the potency value (LD 50 of protection in mice) of this vaccine to be superior to that of formolized vaccine, and compare the results in two groups of bitten persons treated, respectively, with irradiated vaccine and by the classical Pasteurian method.

Treatment with irradiated vaccine of not less than 1,000 LD 50 protection consisted in the simultaneous injection of 1 cc. subcutaneously and of 0·2 cc. intradermally on each of 15 consecutive days.

Between July 1951 and December 1954 irradiated vaccine was administered to 4,718 persons; of that number 448 fulfilled the following conditions: they had been bitten by animals proved by laboratory investigation to have been rabid at the time of biting, had been bitten through naked skin, had arrived for treatment within 7 days of being bitten, and had been observed for 6 months after completion of treatment; among these 448 there was no death from rabies; among the total 4,718 treated there were 3 (0·06 per cent.) cases of neuroparalytic accident.

During the same period 6,367 persons received classical Pasteurian treatment; among 460, who fulfilled the conditions indicated above, 20 (4·35 per cent.) died of rabies; among the total 6,367 treated 36 (0·57 per cent.) developed neuroparalytic accidents. *G. Stuart*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

Girard, G. La peste. Sa situation actuelle dans le monde. Perspectives d'avenir. [**The Present Situation and Future Prospects regarding Plague throughout the World**] *Rev. Méd. et d'Hyg. d'Outre-Mer.* 1956, Feb. 15, v. 28, No. 243, 22–30. [29 refs.]

A general review and discussion by a well-known authority.

Macchiavello, A. Estudios sobre peste selvática en América del Sur. I. Concepto y clasificación de la peste selvática. [**The Meaning and Classification of Silvatic Plague**] *Bol. Oficina Sanitaria Panamericana.* 1955, Oct., v. 39, No. 4, 339–49, 1 coloured fig. [10 refs.]

The author begins by explaining that the term "selvatic", *alias* "silvatic" or "sylvatic" plague, designates the form of the disease which occurs as a permanent reservoir of infection among the rodents of wild uninhabitated regions; he quotes the remarks of Ricardo Jorge who first described silvatic plague as an infection of wild [*sauvage*] rodents which lived in desert regions (steppes, veld, etc.) so that it could suitably be called "silvatic". While admitting that this name is not satisfactory the author considers it preferable to "wild-rodent plague", which he regards as suggesting that the rodents concerned are fierce and aggressive. The French and Spanish equivalents of wild rodents are *rongeurs sauvages* and *roedores salvajes*, and it appears that these, especially the Spanish name, suggest a greater degree of ferocity than the English name, which can be freed from any taint of disparagement by calling them "rodents of the wilds".

The author discusses at considerable length the problem of classification of plague and suggests three distinct systems, one based on the epidemiology of animal plague, another based on the ecology of animal plague, and the third combining the epidemiological and ecological features which are most pronounced in the disease. In the last of these the author prefers to add the name of the rodent concerned to the ecological name and in the following list examples of these names are added in brackets:—

(1) *Pestis nautica* (*Rattus rattus*, etc.);
(2) *P. urbana* (*R. norvegicus*, etc.);
(3) *P. urbanoruralis* (*R. rattus* and *Sigmodon peruanus*, etc.);
(4) *P. ruralis domestica* (*R. alexandrinus*, etc.);
(5) *P. murina campestris progressiva* (when infection is extending from domestic murine rodents to peridomestic and field rodents, *e.g.*, from *R. rattus* to Cricetinae, etc.);
(6) *P. campestris regressiva* (when infection of rodents of the open country is reverting to field and domestic rodents);
(7) *P. silvestris* (plague of the open country affecting Caviidae, Cricetinae and Leporidae);
(8) *P. silvatica* (plague of rodents of the wilds, deserts and other uninhabitable places affecting Sciuridae, Gerbillinae, Cricetinae and Leporidae).

[The above classification is likely to be regarded as too complicated for general adoption, but the basic principle is sound; it would involve for each type the adoption of a simple Latin word descriptive of the ecology of the rodent concerned and of the specific or generic name of the rodent reservoirs when this is known.] *John W. D. Megaw*

Brygoo, E. R. & Courdurier, J. Comportement des souches malgaches de *Pasteurella pestis* à l'égard du rhamnose. [**The Action on Rhamnose of Strains of** *Pasteurella pestis* **from Madagascar**] *Ann. Inst. Pasteur.* 1955, Dec., v. 89, No. 6, 688–92. [14 refs.]

The production of acid from rhamnose by *Pasteurella pseudotuberculosis* and the failure of *Pasteurella pestis*, as a rule, to produce it renders this reaction specially interesting to epidemiologists and taxonomists since pseudotuberculosis is a naturally occurring disease of the guineapig, an animal commonly used in the diagnosis of plague. Though most authors agree that *P. pestis* does not ferment rhamnose, yet several writers claim to have isolated rhamnose-fermenting strains from old laboratory cultures, or by the action of a bacteriophage, or from glycerol-positive strains. The authors have made use of the large collection of strains of *P. pestis* maintained at the Pasteur Institute at Tananarive to study this question.

Ninety-four of these strains are of human origin, of which 93 have been isolated by the inoculation of guineapigs (pseudotuberculosis of the guineapig does not occur in Madagascar) and 1 by direct blood culture. Five strains were from plague in rats, 2 from naturally occurring plague in the rabbit, 1 from naturally occurring plague in a guineapig, 1 from the inoculation of a batch of *Xenopsylla cheopis*, and 2 from experimental plague in the lemur.

One hundred of the strains had been maintained in the laboratory for over a year, 67 of them for more than 5 years and the oldest for 29 years. All when tested were glycerol-negative.

The strains were tested in a medium made up as follows:—Bacto Tryptose 1 gm., proteose peptone 2 gm., Difco Casamino acid 1 gm., sod. chlor. 1 gm., rhamnose 2 gm., water 200 cc., phenol red, as indicator, as required. The medium was sterilized by filtration and tubed in 4 cc. quantities. Each tube was inoculated with one loopful of a 3- to 7-day culture grown on Martin's agar. The tubes were kept at laboratory temperature and examined every day for one month. The medium became reddish orange during the first few days, owing perhaps to variation in the Eh of the medium when growth was very active. The production of acid was shown by a change to a distinct yellow colour and only tubes showing this were considered positive. When no acid was formed the medium usually became alkaline. This change may precede, and sometimes follow, acid production indicating then the exhaustion of the rhamnose. Control tubes without rhamnose showed no trace of acid. Six strains of *P. pseudotuberculosis* all produced acid, under the same conditions, in 2 to 3 days.

Of the 105 strains studied 2 regularly produced acid, 1 of them in 2 to 3 days, and the other in 6 to 10 days. These 2 strains had been isolated from human cases, 1 in 1949 the other in 1952, and had never been cultured in rhamnose. Fifty-one strains, each tested at least twice, gave

negative results. Fifty-four strains produced acid at least once in several tests. From a rhamnose-positive culture a strain could be isolated which fermented rhamnose regularly and rapidly even when the parent strain did so only slowly and irregularly. This was confirmed on 20 occasions when each time a variant fermenting rhamnose in 48 hours was obtained.

The results prove that the fermentation of rhamnose is a general property of *P. pestis*, at least of Madagascar strains, appearing when the medium is particularly favourable to growth. Examination of the results, given in a table, shows that the strains reported negative are those least often tested, and it is probable that if repeated cultures had been made the number of these strains would have been considerably reduced. The property of fermenting rhamnose is not confined to glycerol-negative strains and does not require the presence of bacteriophage.

C. C. B. Gilmour

Holdenried, R. & Morlan, H. B. **Plague-Infected Fleas from Northern New Mexico Wild Rodents.** *J. Infect. Dis.* 1955, Mar.–Apr., v. 96, No. 2, 133–7.

From July 1951 to May 1953, surveys of rodents and their ectoparasites, with special regard to the occurrence of *Pasteurella pestis*, were made in 30 localities near Santa Fe, New Mexico. A small epizootic area was located which involved primarily mice (*Peromyscus* and *Reithrodontomys*) and woodrats (*Neotoma*); marmots and prairie dogs were absent in the epizootic area and ground squirrels and chipmunks few. These animals are frequently considered to be important in North American sylvatic plague [this *Bulletin*, 1942, v. 39, 549]. Where they did occur they were few and their distribution discontinuous. The mice and woodrats were widely distributed and locally numerous and, it is suggested, this may make them suitable vehicles for the dissemination of plague. *P. pestis* was isolated from 6 species of fleas and 6 species of rodents.

D. S. Bertram

Kartman, L. & Lonergan, R. P. **Observations on Rats in an Enzootic Plague Region of Hawaii.** *Pub. Health Rep.* Wash. 1955, June, v. 70, No. 6, 585–93, 4 figs. [25 refs.]

"Observations are reported concerning wild rodents inhabiting areas within an enzootic plague region on the island of Hawaii. The rat species *Rattus hawaiiensis*, *Rattus rattus* subspecies, and *Rattus novegicus* were captured alive, marked, released, and recaptured to gain some idea of their survival, movements, and interrelations. Results suggested that none of the rat species migrates extensively, that they constitute more or less sedentary populations, and that they appear to coexist in an environment which favors their close physical proximity. Thus, in the

areas studied, there appears to be a continuous rodent population having characteristics favorable for the perpetuation of wild rodent plague."

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Banerjea, R. & Bhattacharyya, D. C. **Bacteriological Diagnosis of Suspected Cholera Cases in the Declining Period of an Epidemic.** *Indian Med. Gaz.* 1955, Jan., v. 90, No. 1, 1–2.

Rectal swabs from 131 patients with cholera-like symptoms were examined for the presence of *Vibrio cholerae* during the decline of a cholera epidemic. When plated on bile salt agar 18 (13·7 per cent.) were positive. When plated on the Wilson and Reilly medium as well, 24 out of 112 swabs (21·4 per cent.) were positive. Of these 112 swabs 11 were positive on both media and 4 on bile salt only, whereas 13 were positive on the Wilson and Reilly medium only.

The use of the Wilson and Reilly medium therefore raised the number of positive swabs from 13·3 to 25 per cent. Many of the patients did not show the more severe symptoms of cholera, and to determine whether other intestinal pathogens were present in these cases all 112 specimens were plated on a modification of SS agar [Panja and Ghosh., *Bull. Hyg.*, 1944, v. 19, 385]. Non-lactose-fermenting organisms were isolated from only 12 of them. No *Salmonella* or *Shigella* was found except *Shigella alkalescens* which was isolated from 1 specimen. The other non-lactose-fermenting organisms isolated were paracolon bacteria (4), *Alkaligenes* (4), *Ps. pyocyanea* (2), and a non-agglutinating vibrio (1).

C. C. B. Gilmour

De, S. N., Bose, S. N. & Mondal, A. **Observations on Blood Count and Blood Sugar in Cholera.** *Brit. Med. J.* 1955, Oct. 29, 1065–6.

There is in cholera a short period of crisis when dehydration is very severe. Adequate intravenous saline will usually restore the pulse and the circulation, but in some cases this measure fails. Cortisone might tide the patient over this crisis. "In order to provide a rational basis for such therapy, the present study was undertaken to see if in cholera there is evidence of suprarenal activity as reflected by changes in the blood-sugar and blood count."

From all male patients admitted for cholera to a Calcutta hospital

3 ml. of blood was taken before confirmation of the diagnosis or the institution of treatment. Control examinations were carried out on members of the staff of the hospital. The results were grouped in respect of vibrio-positive patients, vibrio-negative patients, and controls; there happened to be 18 in each of the first two groups and 18 controls were included.

Compared with the normal of the population, the red cell count and haemoglobin were significantly increased in the patients, as were also the total white cell count and the neutrophil percentage. The lymphocyte and eosinophil counts showed both total and percentage significant decreases in both groups of patients and more so among the vibrio-positive patients. There was a reduction in the blood sugar among the patients, but more so in the vibrio-negative group.

The rise in haemoglobin and red cells is apparently due to haemoconcentration, but the rise in the leucocyte count cannot be entirely due to this, since there is a rise also in the ratio of white to red cells. There is thus a true leucocytosis which is due to an increase in neutrophil granulocytes and a marked decrease in lymphocytes and eosinophils. These changes are similar to those occurring in mice subjected to alarm stimuli. Other clinical emergencies bring about a fall in eosinophils. These changes occurred in both groups of patients and indicate a non-specific stimulation of the pituitary-adrenal axis by the associated dehydration, shock and anoxia.

Most patients exhibited hypoglycaemia, but a few hyperglycaemia. The hypoglycaemia of the majority may have been a manifestation of advanced shock and due to a deficiency of cortical hormone.

[It is not clear whether the authors consider the vibrio-negative group to consist of true cholera unconfirmed bacteriologically or of cases of diarrhoea from other causes; they refer to these as cases of "non-choleric diarrhoea", but also state that they "are usually regarded as true cases of cholera (at least during epidemics), and lack of bacteriological confirmation is believed to be due to inadequacy of cultural methods".

Their conclusions that these cytological changes are due to increased suprarenal cortical activity is a reasonable proposition, but it is not clear how the reported observations support the hypothesis, other than by rather slender analogy.] *L. E. Napier*

Gallut, J. Du rôle de la glande surrénale dans l'intoxication cholérique expérimentale de la souris. [**The Function of the Suprarenal Gland in the Toxaemia of Experimental Cholera in the Mouse**] *C.R. Soc. Biol.* 1955, July, v. 149, Nos. 13/14, 1414–16.

The part played by the suprarenal gland in cholera toxaemia experimentally produced in the mouse was studied by determining the LD 50

of the toxin elaborated by *Vibrio cholerae*, Inaba, injected intraperitoneally into white mice treated beforehand by adrenalectomy and cortisone either singly or in combination and with corticotrophin. At least 6 mice were injected with each dose of toxin. Seventy-five mice received toxin only and served as controls. Adrenalectomy was performed on 80 mice and after 8 days these were divided into 2 lots, 52 of them being injected with toxin and 28 receiving 2 mgm. of cortisone subcutaneously 1 hour before the toxin. Seventy-five normal mice were given 2 mgm. of cortisone one hour before injection and 50 received 5 mgm. of cortisone spread over 4 days prior to injection. Twenty-five mice were treated with 2 mgm. corticotrophin subcutaneously one hour before the injection and 25 were given 5 mgm. corticotrophin spread over 4 days before being injected. The LD 50 of the toxin for all those mice was calculated by the method of Bonet-Maury *et al.* [*Bull. Hyg.*, 1954, v. 29, 863]. The results are shown in the following table:

Lot No.	Treatment	LD 50 cc.	Limit of variation	
			lower	upper
1	None (controls)	0·020	0·010	0·041
2a	adrenalectomy	0·0021	0·001	0·0043
2b	*ibid.* + cortisone 2 mgm.	0·140	0·035	0·560
3a	cortisone 2 mgm.	0·520	0·216	1·248
3b	cortisone 5 mgm.	0·086	0·020	0·361
4a	corticotrophin 2 mgm.	0·018	0·010	0·030
4b	corticotrophin 5 mgm.	0·100	0·055	0·180

Removal of the suprarenal gland renders the mouse more susceptible to cholera toxin, the LD 50 in adrenalectomized animals being one-tenth of that of the controls. The effect is counterbalanced by cortisone, since in adrenalectomized animals treated with that hormone the LD 50 is 7 times greater than that of the controls. Cortisone by itself has a protective action varying however with the scheme of dosage. Animals receiving 2 mgm. 1 hour before injection are able to stand 26 times more toxin than the control animals, but the larger dose of 5 mgm. spread over 4 days has less protective effect and raises the LD 50 only 5 times. Corticotrophin has no protective effect in a dose of 2 mgm. 1 hour before inoculation but in a dose of 5 mgm. over 4 days the effect is similar to that of cortisone given in the same manner.

These experiments show that the suprarenal gland plays a part in the resistance of the mouse to experimental cholera toxaemia. The protective action of cortisone, according to those who have studied it, would appear to be on glycolipid toxins, in the case of cholera on the thermostable enterotropic fraction.

It is therefore probable that the therapeutic effect of cortisone in cholera might be limited by its lack of protective action on the neurotropic toxin. The use of cortisone in cholera has not been the subject of any paper so far, but favourable results from the use of corticotrophin in a limited number of cases have been reported by LAIGRET [this *Bulletin*, 1956, v. 53, 49]. *C. C. B. Gilmour*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

BROOKE, M. M., MELVIN, Dorothy M., SAPPENFIELD, R., PAYNE, F., CARTER, F. R. N., OFFUTT, A. C. & FRYE, W. W. **Studies of a Water-Borne Outbreak of Amebiasis, South Bend, Indiana. III. Investigation of Family Contacts.** *Amer. J. Hyg.* 1955, Nov., v. 62, No. 3, 214–26, 2 figs. [14 refs.]

Following a small outbreak of amoebiasis in a factory, resulting from sewage contamination of a water supply in South Bend, Indiana [this *Bulletin*, 1955, v. 52, 777], the incidence of infection among the employees and their family contacts was investigated in order to determine the importance of intrafamilial transmission and of the family food-handler as a source of infection. Among the 1,542 employees 52·4 per cent. were infected, compared with 4·4 per cent. in a neighbouring plant. One-third of the employees were asked to collect specimens of faeces from their spouse and other members of the family, excluding those families in which more than one member was employed at the plant. The specimens were preserved and examined later by concentration methods. Since relatively few *Entamoeba histolytica* infections were found, a combined amoebic prevalence rate of *E. histolytica*, *E. coli* or *Endolimax nana* was used in analysing the results, any person infected with one or more of these being counted as a single positive. This was believed to give a good index of transmission.

Specimens were obtained from 600 family contacts of 334 employees, representing 50 per cent. of the total number of contacts in the families. The results are shown in a series of tables. No helminth infections were found but 25·2 per cent. harboured one or more intestinal protozoa, 3·7 per cent. being infected with *E. histolytica*. Higher rates, though not significantly so, were found among the contacts of positive employees as compared with negative employees, in rural compared with urban areas and in families with privies compared with those having flush

latrines. There was no difference in infection rate between persons who were served by infected food-handlers and those who were not. The amoebic prevalence rate in contacts reached a peak in the age-group 20–30, and in females the rate fell after the age of 40 while in males it continued to rise. Smaller families showed a higher rate than larger families but this may have been affected by the fact that they contained more adults.

This study tends to minimize the importance in a good home environment of intrafamilial transmission and of infection in food-handlers. In view of these findings serious consideration must be given to other means of transmission in urban communities. It is suggested that water-borne infection may be more frequent than is suspected. *T. H. Davey*

Mathew, S., Singh, B. N. & Misra, S. S. *Entamoeba histolytica* **and other Amoebic Infections in 503 Patients.** *J. Indian Med. Ass.* 1956, Jan. 1, v. 26, No. 1, 13–15. [10 refs.]

"The stools of 503 patients of a Lucknow Hospital were carefully examined for the presence of intestinal amoebae. The percentage of infection of *Entamoeba histolytica* was low being only 3·8 while that of *E. coli* was 17·5. Among a group of 70 patients suffering from intestinal disorders the incidence of *E. histolytica* (7·1 per cent) and *E. coli* (21·4 per cent) was a little higher. *Iodamoeba butschlii* and *Endolimax nana* were found only rarely."

Harinasuta, C. & Harinasuta, T. **Studies on the Growth** *in vitro* **of Strains of** *Entamoeba histolytica*. *Ann. Trop. Med. & Parasit.* 1955, Oct., v. 49, No. 3, 331–50, 6 figs. [19 refs.]

The authors describe the results of a study on various aspects of the growth of *Entamoeba histolytica* in cultures. One of the problems dealt with concerns the characteristics of 3 strains when grown in different media, *viz.* (1) Locke-egg-serum-saline (LES), (2) liver infusion agar (LIA), (3) inspissated horse serum (HSre), and (4) aqueous egg-yolk infusion (EYI). All the strains grew best in LES after 48–72 hours' incubation at 37°C. During the first 6–8 hours the *p*H fell to the acid side, while the oxidation-reduction (O-R) potentials became markedly negative in 4–6 hours, after which they remained stationary in the diphasic media.

During the first few hours of growth there was a lag period in the growth of amoebae, when many degenerated and the total population decreased considerably. However, if the media were preconditioned by seeding with the concomitant bacteria of the strains in question, this lag was reduced and eventually disappeared, so that in preconditioned media the amoebae started multiplying immediately. In media seeded 24 hours

before inoculation of the amoebae these grew better than in untreated media. Still better results were obtained by adding to the medium large numbers (20,000 million) washed bacteria, which reduced its O-R potential rapidly, thereby providing anaerobic conditions which enabled the amoebae to establish themselves in cultures. However, the addition of large numbers of bacteria retarded the growth of amoebae during the first 24 hours. It was also found that the growth of the amoebae was promoted by addition to the medium of killed bacteria, suggesting that some thermostable nutritional factors for the amoebae are provided by bacterial cells.

Finally, the course of the development of *E. histolytica* during the first 12 hours of cultivation was followed. It was shown that at first they decreased in numbers, owing to the initially positive O-R potential in the medium, but when this was reduced to negative levels the surviving amoebae multiplied, producing a new generation in 5–6 hours.

C. A. Hoare

Mukherjee, A. M. & Chatterjee, S. N. **Analysis of Sigmoidoscopic Findings in 205 Cases of Chronic Bowel Disorder.** *Calcutta Med. J.* 1955, Sept., v. 52, No. 9, 269–71.

At the Calcutta School of Tropical Medicine sigmoidoscopy is done almost as a routine on cases of chronic bowel disorder. In 1954, 205 such cases were thus examined. The ages of the patients ranged from 10 to over 50 years; more than half of them were between 20 and 40; there were 173 males and 32 females. The presenting symptoms are listed in a table; abdominal pain and a history of dysentery were the most common, but " vague neurotic symptoms " also were frequent. The sigmoidoscopic findings also are listed in tables; in 74 cases they were normal; in 42 there was congestion only, and in 60 congestion with ulceration. *Entamoeba histolytica* was found in the stools and in swabs on sigmoidoscopy in 19 cases; in [?] 37 cases [the text states 27 and the table 37 cases] the parasite was found in the stools but not in swabs obtained sigmoidoscopically; in 8 cases parasites were recovered sigmoidoscopically after repeated negative stool examinations. Sigmoidoscopy, therefore, in some cases may be the only means of arrival at a conclusive diagnosis.

A. R. D. Adams

Radke, R. A. **Ameboma of the Intestine: an Analysis of the Disease as presented in 78 Collected and 41 Previously Unreported Cases.** *Ann. Intern. Med.* 1955, Nov., v. 43, No. 5, 1048–66, 1 fig. [93 refs.]

" Ameboma . . . is a localized thickening of the intestinal wall about an ulceration caused by *Endamoeba histolytica* which results in a lesion capable of being mistaken for a neoplasm because of the associated

narrowing of the intestinal lumen and presence of a palpable mass." The author has analysed the literature on 78 published cases, and reports on another 41 in the U.S. Armed Forces. The location of the lesions and the complications they caused are listed in tables; and in other tables are set out the symptoms and associated complications. The commonest symptoms were diarrhoea and lower abdominal colic; the commonest physical finding was an abdominal or rectal tumour. Barium enema examination, when done, usually produced a picture suggesting malignancy. Forty-one of the 119 patients died, but only 8 of these 41 had had anti-amoebic treatment. Of 42 patients subjected to operation, and subsequently studied, 26 died.

From analysis of the varied treatments used in these cases the author concludes that surgery tends to a fatal outcome (26 of 42 died), and that no medical treatment at present available is completely satisfactory. He considers that mepacrine combined with carbarsone is the best treatment available, as all of the 5 cases he personally so treated made a prompt recovery. He states " it is my belief that treatment of amebiasis with emetine should be abandoned ", in view of its therapeutic inefficiency and its toxicity. Antibiotic treatment is useful as an adjunct to other anti-amoebic treatment.

The pathology of amoebic infection may take one of two forms—a necrotizing form or a hyperplastic form; amoebomata are a manifestation of the latter, and are the result of thickening about a large ulceration or several closely-grouped smaller ulcerations. *A. R. D. Adams*

Faust, E. C.; Thompson, P. E.; Anderson, H. H.; Schock, R. U.; Balamuth, W. **Symposium on Chemotherapy of Amebiasis.** [Presented before the Medicinal Chemistry Section, American Chemical Society, Kansas City, March 25, 1954.] *Antibiotic Med.* New York. 1955, Nov., v. 1, No. 11, 596–631, 2 figs. [Numerous refs.]

This Symposium was given at a meeting of the Medicinal Chemistry Section of the American Chemical Society in Kansas City on 25th March 1954 and deals with recent advances in the treatment of acute and chronic amoebiasis as well as laboratory findings in connexion with this disease.

The introductory talk on *The Amebiasis Problem* by E. C. Faust is short and simple. He considers that infection in the United States with *E. histolytica* is still an important public health problem and outlines how the infection may be spread. In his opinion all strains of the amoebae are potential pathogens and accompanying bacteria also play an important part in the infection. Diagnosis and treatment are dealt with on standard lines.

The following article on *The Evaluation of Antiamebic Drugs on Experimental Animals* is by Paul E. Thompson. He believes that *in*

vivo methods of screening have a place along with other techniques in seeking new amoebicides. A useful table indicates the types of experimental infections that may be used as guides for obtaining information on the activity of drugs in comparable conditions in human patients. Thus the mild infections in man correspond as far as treatment is concerned with infections of *E. histolytica* in monkeys or the natural infection in hamsters. In cats, dogs, guineapigs, rabbits and rats dysenteric symptoms may occur. By special techniques hepatic infections may also be obtained in hamsters. Test procedures in different animals are outlined and evaluated. Besides being useful for a study of infections the monkey can also be used to provide data on the pharmacology and toxicity of drugs, but size and cost of upkeep militate against widespread use of this animal. Arguments for and against the use of the rat and hamster are also put forward. Data from a large number of experimental infections with *E. histolytica* in dogs show that only a small percentage recover spontaneously. The study of intestinal amoebiasis in cats, guineapigs and rabbits has provided information of limited value. The factors influencing the selection of a particular animal for test are briefly summarized and a table provides data on the therapeutic doses of different amoebicides required by different animal species.

H. H. Anderson then discusses *Pharmacology and Clinical Evaluation of Amebicides.* This evaluation of potential amoebicides is a many-sided problem and involves the use of *in vitro* as well as *in vivo* tests with different laboratory hosts. The test procedures of the authors are described and some results obtained with newer antibiotics discussed. The need for uniformity in testing procedures and evaluation of amoebicides is emphasized.

R. U. Schock writes on *The Chemical Constitution of Antiamebic Drugs.* The early use of ipecacuanha in Brazil, of kurchi bark in India and *Brucea javanica* in China in the treatment of dysentery are given brief mention. Other drugs from natural sources are the antibiotics, but they for the most part appear not to act directly on amoebae. In clinical practice the most potent to date is fumagillin. Among the organometallic compounds carbarsone is one of the least toxic of the pentavalent arsenicals. Trivalent arsenicals are generally too toxic, but derivatives such as the thioarsenites have shown increased activity and lower toxicity than the parent arsenoxides. The iodinated hydroxyquinolines introduced shortly after the first world war are still widely used. The 4-aminoquinolines, chloroquine and amodiaquine are outstanding for the treatment of amoebic hepatitis.

In the final article W. Balamuth discusses *In vitro Approaches to the Chemotherapy of Amoebiasis* and indicates how far the methods have helped in the selection of new amoebicides. There are so many variables involved in the *in vitro* techniques, not least disturbing being the presence of a bacterial flora, that it is frequently difficult to come to a decision whether a substance is acting directly on the amoeba or not.

It is concluded that the use of *in vitro* methods has been justified in screening procedures. Uniformity of method is, however, vital if the results obtained throughout the world are to prove suitable for evaluation and comparison. *J. D. Fulton*

Basmadji, E., Hanoudi, S. & Zebouni, N. **Study of the Effects of Camoform on Chronic Intestinal Amebiasis in Men.** *Bull. Endem. Dis.* Baghdad. 1955, July, v. 1, No. 3, 253–6, 2 figs.

Twenty-eight patients in Baghdad who were passing *Entamoeba histolytica* cysts (25 patients) or pre-cystic amoebae (3 patients) were treated with Camoform [this *Bulletin*, 1955, v. 52, 156] tablets. The dosage was 20 mgm. per kgm. of body weight daily for 5 days. Stools [apparently one on each occasion] were thereafter examined at monthly intervals for up to 6 months. The authors considered the results in the cyst-passers to be " certain " and " encouraging " [though 11 of them demonstrably were not cleared of their infections]; none of the 3 patients passing amoebae were sterilized of their infections. *A. R. D. Adams*

Seneca, H. **Tetracycline in the Treatment of Intestinal Amebiasis.** *Antibiotic Med.* New York. 1955, Apr., v. 1, No. 4, 221–4. [31 refs.]

The author has treated with tetracycline 20 adults suffering from chronic amoebiasis, some of them with a past history of dysentery but all quiescent at the time of treatment. In addition to a variety of indefinite symptoms these patients all had livers enlarged one to two and a half fingers before the treatment. The dosage of the drug was 500 mgm. by mouth thrice daily after meals for 8 days (a total of 12·5 gm.). The " stools were examined at the end of one and three months " thereafter. In 7 cases the treatment was repeated after an interval of 4 to 8 weeks " although no amebae were found in the stools ". Symptoms and signs markedly diminished, amoebae vanished from the stools, and there was a reduction in the size of the livers. The conclusion reached was that 19 of the 20 patients " have been successfully treated with tetracycline ". The patient who was not " successfully treated " suffered from diarrhoea and pruritus, so the treatment had to be stopped. *A. R. D. Adams*

Shafei, A. Z. **A Comparative Study of the Use of Combinations of Fumagillin and Tetracycline or Erythromycin in the Treatment of Intestinal Amebiasis.** A Preliminary Report. *Antibiotic Med.* New York. 1955, Sept., v. 1, No. 9, 496–503, 4 figs. [10 refs.]

Twenty patients with amoebiasis were treated concurrently with fumagillin and tetracycline, and another 20 with fumagillin and erythromycin. None were asymptomatic; all had sigmoidoscopically visible

ulceration. The dosage of fumagillin given to every patient was a total of 300 mgm., as 10 mgm. doses thrice daily for 10 days. The dosage of tetracycline was 10 gm. in 10 days for 10 patients, and 10 gm. in 5 days for another 10 patients. That of erythromycin was 6 gm. in 10 days for 10 patients; and 6 gm. in 5 days for another 10 patients. [The statements in the text and in the confusing tables do not coincide; to the abstracter it seems that there are several careless errors in the tables.] Observation of the patients followed over 3 months. This work " suggested " that these courses of treatment have a high curative action in intestinal amoebiasis [though from 10 to 40 per cent. of patients variously are admitted to have " relapsed " within 3 months].

A. R. D. Adams

Shafei, A. Z. **The Relative Merits of Fumagillin in Amebiasis.** *Antibiotic Med.* New York. 1955, June, v. 1, No. 6, 339–45. [22 refs.]

Thirty-six patients, in Egypt, have been treated for chronic amoebiasis with fumagillin. None of the patients were merely " healthy or asymptomatic cyst passers ". Twenty-four patients were given 30 mgm. of fumagillin in 3 divided doses, daily for 12 days; 12 were similarly given 60 mgm. for 12 days. " Sigmoidoscopy was found vastly superior to careful stool examination in the diagnosis and follow up of the cases." " Relapses " occurred in 7 cases of the first group, but in only 3 of the second. The fumagillin treatment did not benefit an apparent amoebic hepatitis afflicting 3 patients. No side reactions of significance resulted from the treatments.

A. R. D. Adams

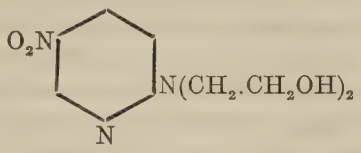
Shafei, A. Z. **Erythromycin as an Amebicide. A Preliminary Report.** *Antibiotic Med.* New York. 1955, May., v. 1, No. 5, 259–65. [10 refs.]

Twenty patients in Alexandria, Egypt, with intestinal amoebiasis were treated with erythromycin; 7 had acute amoebic dysentery and 13 had a history of previous episodes of dysentery. All had already been variously treated. The course of erythromycin consisted of 800 mgm. daily [by mouth] for 10 days; this alone was given to 10 patients; another 3 were given this course concurrently with 0·75 gm. of carbarsone daily for 7 days; the remaining 7 had a similar combined course [erythromycin for 15 days] with continuation of the carbasone over 12 days. Five of the 10 treated with erythromycin " showed persistence of cysts [*sic*] in mucus aspirated during routine sigmoidoscopy " and were re-treated with carbasone. All the 3 patients in the second group showed clinical and parasitic clearance during 3 months' observation. None of the last 7 " relapsed within the three month observation period "; these latter patients also had schistosomiasis, which was not relieved by this treatment. Erythromycin alone does not " clear the cysts ", and it should therefore be given with carbarsone.

A. R. D. Adams

Neal, R. A. & Vincent, Patricia. **The Amoebicidal Activity of 2-Diethanolamino-5-Nitropyridine.** *Brit. J. Pharmacol. & Chemotherapy.* 1955, Dec., v. 10, No. 4, 434–5.

The drug used in the title has the following constitution:



and has been tested against *E. histolytica* infections of the rat caecum, against liver abscess in hamsters as well as *in vitro* against *E. histolytica* in culture with a single organism by methods already outlined [this *Bulletin*, 1948, v. 45, 518; 1951, v. 48, 640; 1952, v. 49, 511]. It appears that the above compound was as effective or somewhat less so than Chiniofon in rats. Against liver abscess in hamsters it was non-effective. The drug appeared to act directly against *E. histolytica* in culture and was as effective or more so than Chiniofon. In human patients early results were favourable, but relapses occurred. No activity was shown against a number of other protozoa. *J. D. Fulton*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Leeson, H. S. **Further Notes on the Geographical Distribution of Old World Species of *Ornithodoros* (Acarina).** *Bull. Entom. Res.* 1956, Jan., v. 46, Pt. 4, 747–8. [11 refs.]

Additional records are given to those recorded in the author's previous paper [this *Bulletin*, 1954, v. 51, 269]. These are: *Ornithodorus arenicolous*, littoral of eastern and western deserts of Egypt; *O. capensis*, New South Wales and Guam; *O. coniceps*, Morocco; *O. delanoei*, Egypt; *O. erraticus*, Turkey; *O. foleyi*, Egypt; *O. lahorensis*, on sheep in Macedonia, also Jugoslavia and Turkey; *O. salahi*, Israel; *O. tartakovskyi*, N.W. Persia; *O. tholozani*, Egypt; *O. zumpti*, burrow of *Rhabdomys pumilio*, S. Africa. With reference to *O. savignyi*, specimens were first collected in Ceylon by Crawford, and the record of this species from the Belgian Congo is regarded as uncertain. *B. R. Laurence*

Anderson, T. R. & Zimmerman, L. E. **Relapsing Fever in Korea. A Clinicopathologic Study of Eleven Fatal Cases with Special Attention to association with Salmonella Infections.** *Amer. J. Path.* 1955, Nov.–Dec., v. 31, No. 6, 1083–1109, 14 figs. on 6 pls. [35 refs.]

Louse-borne relapsing fever occurred in Korea among United Nations personnel and Korean and Chinese prisoners-of-war. The authors report

a careful clinicopathological study of 11 fatal cases of relapsing fever. In 5 cases death was due to relapsing fever alone, in 3 there was a concomitant *Salmonella* septicaemia, in 1 case concomitant bacillary dysentery and in 2 cases death appeared to be due to a *Salmonella* infection following successful eradication of the spirochaete of relapsing fever. The record is well documented and illustrated. In 7 cases relapsing fever was not diagnosed in life or at the post mortem but *Spirochaeta recurrentis* were demonstrated by Warthin-Starry staining of tissues, particularly of the spleen and brain. Deaths due to relapsing fever alone resulted from intracranial haemorrhages in 2 patients, the remaining 3 died from meningitis, hepatitis and spontaneous rupture of the spleen, respectively. The association of louse-borne relapsing fever with bacillary dysentery and enteric fever—all diseases of defective hygiene—has long been recognized. This study illustrates the importance of salmonellosis as a complicating disease. The combination of relapsing fever and salmonellosis has been noted previously and although the latter infection could theoretically result from the ingestion of *Salmonella enteritidis* known at times to be harboured by lice, it seems more probable that the coincident salmonellosis is related to the unhygienic conditions in which infestation with lice occurs.

The authors stress the importance of physicians called to serve in unhygienic surroundings becoming acquainted with the manifestations of louse-borne relapsing fever. *Frederick J. Wright*

Cherry, J. K. T. **The Prevention and Treatment of Tick-Borne Relapsing Fever with special reference to Aureomycin and Terramycin.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 563–73, 1 graph. [25 refs.]

In a field experiment strong evidence was obtained that the use of a water-miscible preparation of hexachlorocyclohexane (BHC) caused a rapid reduction in the incidence of ticks in the treated African houses and a corresponding fall in the incidence of relapsing fever. Although not conducted as a strictly controlled experiment untreated adjoining areas showed no comparable reduction in incidence. It appears that the occupants of a house can protect themselves over a period of 9 months at a cost of fivepence per house.

The second part of this article attempts to assess the value of chlortetracycline (Aureomycin) and oxytetracycline (Terramycin) in the treatment of tick-borne relapsing fever. Seventy-one cases were studied, the cases being allotted in rotation to one of 3 groups. One group was a control group in which patients received Veganin only, in the other groups chlortetracycline or oxytetracycline respectively were used. In the first series the dose for adults was 0·5 gramme only; in a later series this was increased to 0·5 gramme twice daily for two days. Patients under

10 years of age received half these doses. Parasitaemia rapidly disappeared with the tetracycline drugs but the duration of the pyrexial attack was not appreciably shortened. Relapses, particularly with the larger doses, after tetracycline therapy were few but occurred after intervals of up to 38 days and an unconfirmed possible relapse occurred after 84 days. The rapid disappearance of the parasites from the blood is encouraging but observations are now proceeding with chlortetracycline, 0·25 gramme every 6 hours for 5–7 days, this course being repeated after an interval of 10 days in an attempt to avoid later relapses or persistence of the infection in nervous tissue as has been shown to occur experimentally in rats by Heisch and Harvey. [See also this *Bulletin*, 1953, v. 50, 815.]

Frederick J. Wright

Horrenberger, R. Transmission expérimentale de *Spirochaeta hispanica* au chien par la morsure de rat. [**The Experimental Transmission of *S. hispanica* to the Dog by the Bite of the Rat**] *C.R. Soc. Biol.* 1955, July, v. 149, Nos. 13/14, 1432–4.

The author infected 4 dogs by the inoculation of a strain of *Spirochaeta hispanica* isolated from the brain of a sewer rat in 1952 and subsequently maintained in guineapigs and white rats. All the dogs developed latent infections without any clinical symptoms. Two dogs also became infected, one after swallowing the fresh carcass of a white rat and the other the liver of a rat containing spirochaetes. Four dogs were then exposed to the bites of 8 rats with negative results, although the saliva of 6 of these rats was shown to be infective when inoculated into guineapigs. In a second series of experiments, however, 4 younger dogs were similarly exposed to the repeated bites of infected rats and all 4 subsequently developed latent infections of *S. hispanica*. [See also this *Bulletin*, 1955, v. 52, 783; 1956, v. 53, 450.] *Edward Hindle*

YAWS AND OTHER TREPONEMATOSES

Varela, G., Marino, J. & Vázquez, A. Reacciones serológicas lipoídicas en recién nacidos de mujeres con "mal del pinto". Pruebas de adherencia y desaparición de *Treponema pallidum* con sueros sanguíneos de pintos. [**Cardiolipin Reactions in the Serum of Infants of Mothers with Pinta; Immobilization Tests in Sera from Patients with Pinta**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, Sept., v. 15, No. 3, 175–8.

The English summary appended to the paper is as follows:—

"The blood sera from the umbilical cord of infants born of mothers with pinta have been found to give positive Kahn, Mazzini, M.R.H. y

V.D.R.L. (cardiolipine) tests. For this reason it is evident that there is a passive reaginaemia in pinta like in syphilis.

"The adherence and disappearance test for *Treponema pallidum* made with blood sera of pinta patients having positive Kahn and V.D.R.L. tests is also positive."

[See also this *Bulletin*, 1955, v. 52, 272.]

Varela, G. & Palencia, L. Acción "in vitro" de la sinematina B y de la penicilina en la inmovilización del *Treponema carateum*. [**Action *in vitro* of Synnematin B and Penicillin on the Immobilization of *Trep. carateum***] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, Sept., v. 15, No. 3, 179–82, 2 graphs.

The English summary appended to the paper is as follows:—

"According to our results synnematin B has a faster immobilization action than penicillin against *Treponema carateum*. The results therefore suggest the possible use of synnematin B in treponematosis."

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Chatterjee, S. N. **Leprosy and Anti-Leprosy Activities in India.** *Indian J. Dermat.* Calcutta. 1955, Oct., v. 1, No. 1, 29–38, 1 map.

Cochrane, R. G. **Leprosy in Korea.** *Leprosy Review.* 1955, Oct., v. 26, No. 4, 141–6. **Part II.** *Ibid.*, 1956, Jan., v. 27, No. 1, 19–28.

The author's experience shows that the proportion of infective to non-infective cases of leprosy in the lighter coloured races of the world (Mongolian and Caucasian) is higher, 25 to 70 per cent., than in the darker races (Indian and African) in whom it is 15 to 25 per cent. Various estimates have been made of the number of people with leprosy in Korea. In 1953 there were 17,188 in leprosaria and special villages, and it was calculated officially that there was an overall total of 45,000 in South Korea. The author, however, calculates that there are actually about 150,000, which with the population of 29 million would mean approximately 5 per 1,000. Taking 25 per cent. as open infectious cases, there would be about 37,500 spreaders of infection in South Korea.

The author considers that leprosy in S. Korea is a house disease, rather than a village disease as it is in India. This is because the family unit is compact, and leprosy spreads within the family and not readily to other relations (*e.g.*, sons or daughters), who tend to drift away from the parental home. Theoretically the disease should be easier to control on this account.

The second part of the paper deals chiefly with leprosy control. As a first step it is recommended that a special Public Health Officer be appointed " whose specific duty is to investigate the epidemiology of leprosy as seen in Korea ". He would study the nature of leprosy in S. Korea, the infection rate in leprosy colonies, etc., and particularly the open case rate. He would also work through local authorities and collaborate with missionary workers. It is also suggested that with the aid of missions and other voluntary agencies a " pilot scheme " should be set up to assist Government in forming a comprehensive programme of leprosy control, and to indicate how leprosy work can be integrated with the general medical programme of the country.

Foreign aid should " only be given in order to help set up a thorough, scientific, and national Specialist Leprosy Service, covering every aspect of leprosy. . . . Once this Service is established there will be great hopes that leprosy as a serious endemic disease will be brought under control ".

Ernest Muir

Badger, L. F. **Leprosy in the United States.** *Pub. Health Rep.* Wash. 1955, June, v. 70, No. 6, 525–35, 4 figs.

No nation-wide case-finding programme has ever been conducted in the United States to find out the prevalence of leprosy. The data in this paper are based on the records of patients admitted to the National Leprosarium at Carville from its opening in 1921 up to 1953. Patients were admitted from all but 8 of 48 States. Of the 1,465 admitted, 326 were from Louisiana, 324 from Texas, 294 from California, 158 from New York, and 102 from Florida. Of the 1,465 patients 822 were born in the continental United States, and 637 in foreign countries. A number of foreign-born persons in whom clinical leprosy developed after their arrival in the U.S. were not admitted to the leprosarium; thus of 248 patients in California who were born in Mexico only 100 were admitted. Of 50 political entities 15 are recorded as non-endemic, that is without records of patients being born in them, though 7 of these have sent patients born abroad to the leprosarium. " Of 158 patients admitted from New York, 140 were of foreign birth and only 18 were born within continental United States. Of the latter, only 2 were born in New York." During the period 415 patients were admitted from non-endemic States and the District of Columbia. Of these, 288 were born outside continental U.S. and 126 were natives of the U.S., the birthplace of 1 was not known. Of 521 known cases in California, 436 were of foreign birth, 41 were born

in other States, and only 34 were born in California; the birthplaces of 10 are unknown.

Not only is leprosy confined largely to a few States but it is also confined to a limited area in each of these States. In Florida, cases were recognized among residents of only 11 of the 67 counties during the 33-year period, and of only 8 counties during the last 10 years. It has been concentrated in 1 county, Monroe, and within this county, in Key West. Of 96 Florida-born patients 44·5 per cent. resided in Key West at the time of diagnosis.

Of the foreign-born patients admitted 100 were from Mexico, 52 from the West Indies, 49 from the Philippines, 28 from China, 23 from Greece, 18 from Italy, 10 from Russia, and 8 from Spain. Nearly half of the patients were admitted more than 5 years after the onset of the disease, and 17·5 per cent. more than 10 years after onset, the period being considerably longer in the case of European-born patients than in patients born in the West Indies. *Ernest Muir*

de Souza-Araújo, H. C. **The Leprosy Problem in Brazil.** *Mem. Inst. Oswaldo Cruz.* 1954, June, v. 52, No. 2, 427–41, 22 figs. on 7 pls. [Portuguese version 419–26.]

The author first described leprosy in Brazil in 1925, when efforts at control were first being initiated. There were then 1,963 patients in primitive leprosaria, 9,002 known cases, and a total estimate of 24,000. From 1946 to 1950 there were 22,245 new patients recorded, of whom 56·5 per cent. were open cases of leprosy. At the end of 1950 there were 60,623 known cases, 1·12 per 1,000 of the population. Of these there were 21,917 in the State of São Paulo, and 13,591 in Minas Gerais. In 1952 there were 23,421 patients in leprosaria, of whom 7,901 were in the State of São Paulo, and 5,465 in Minas Gerais.

The total amount spent by the Union on leprosy in 1951 was the equivalent of U.S. $1,800,000. There are also 29 preventoria for children of patients, housing (in 1952) some 4,045 children. There are also 93 leprosy clinics. At least 200 dispensaries are needed for follow-up work, the treatment of closed cases, and after-treatment of discharged patients. There are 4 centres for research and training. Many details of the incidence in the various States are given; in some of them leprosy is considered a very serious problem. *Ernest Muir*

Powell, C. S. & Swan, L. L. **Leprosy: Pathologic Changes observed in Fifty Consecutive Necropsies.** *Amer. J. Path.* 1955, Nov.–Dec., v. 31, No. 6, 1131–47, 16 figs. on 5 pls. [17 refs.]

Of the 50 cases examined at necropsy 2 were of the tuberculoid and 48 of the lepromatous type, the type most common in the Carville Leprosarium and in the United States. Changes of secondary amyloidosis were

seen in 23 of the patients in one or more tissues, the organ most affected being the kidney. When the kidney was involved by amyloid change it was usually quite markedly altered. In 19 patients, as a result, death was from renal insufficiency. Out of 49 spleens sectioned 8 contained miliary lepromas. In 3 cases amyloid change was prominent in the mucosa and submucosa of the stomach. The pancreas was not involved. Acid-fast organisms with lepromas were found in 5 of the 46 cases in which adrenal sections were available. In 16 of the adrenal glands sectioned, amyloid change was noted, principally between and replacing cords of cells in all 3 layers of the cortex. In 6 of the 32 bone-marrows sectioned *Myco. leprae* was demonstrable in lepromas, several of the more active cases with widespread miliary lesions had very hyperplastic bone-marrow, and a severe hypochromic microcytic anaemia was present in several cases. " The so-called ' burned out ' cases may reveal few or no organisms. . . . One of the oldest patients in this series became blind from leprous changes in 1898, 8 years after the clinical onset of his leprosy. He refused virtually all specific therapy except for sporadic doses of chaulmoogra oil totalling approximately 1,000 cc. Several years prior to death, over 60 years after the onset of his leprosy, skin scrapings were positive only occasionally. No organisms were demonstrable at necropsy."

As seen from the average duration of life of 20 years after the recorded onset of obvious signs and symptoms, leprosy of itself is not a fatal disease, and the average age at death is 59, less than 10 years below that of the population as a whole.

Myco. leprae was found in at least one tissue in 34 cases.

Ernest Muir

Montestruc, E. Le B.C.G. possède une communauté antigénique avec le bacille de Hansen dont ne peut se prévaloir le *Myc. marianum*. [**BCG possesses an Antigenic Affinity with Hansen's Bacillus which** *Myco. marianum* **does not possess**] *Bull. Soc. Path. Exot.* 1955. v. 48, No. 5, 629–31.

The author confirms the findings of Chaussinand & Viette [this *Bulletin*, 1956, v. 53, 70] and Floch [*ibid.*, 1955, v. 52, 272] regarding *Myco. marianum*. In lepromatous leprosy the Mitsuda reaction is negative in 90 to 95 per cent.; in a similar test with *Myco. marianum* 90 to 95 per cent. of reactions are positive. With BCG 50 per cent. are positive. In this respect there is more affinity of BCG with the lepra bacillus than of *Myco. marianum*. A description is given of a lepromatous patient who had received, 21 and 15 days previously, 1/10 cc. of *Myco. marianum* antigen injected intradermally. A BCG test was made with a glycerin suspension of killed organisms. This resulted in a severe lepra reaction on the face, chest and left lower limb, and large infiltrated areas round about the points of scarification on the arm, while on the other arm

where the *Myco. marianum* antigen had been injected intradermally there was no reaction. The conclusion is arrived at that *Myco. marianum* is useless in the prophylaxis of leprosy. *Ernest Muir*

Montestruc, E. Les réactions lépreuses. Leur traitement par corticothérapie prolongée. (Deuxième note.) [**Lepra Reactions; their Prolonged Treatment with Cortisone**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 5, 631–5.

After treating 5 severe cases of lepromatous leprosy with 25 to 175 mgm. of cortisone daily over a period of 15 months, the author finds that all signs of reaction can be suppressed. This treatment can safely be given, but the patient must be kept under clinical observation and given biological tests. Cortisone therapy is effective in reactions, whether they occur spontaneously or are induced by sulphone therapy. He does not consider that reactions are beneficial; they should be suppressed if they do not get better spontaneously. [See also this *Bulletin*, 1955, v. 52, 653.] *Ernest Muir*

Swan, L. L. & Ross, Hilary. **Clinical Laboratory Aspects of Leprosy.** *Pub. Health Rep.* Wash. 1955, Dec., v. 70, No. 12, 1205–12. [53 refs.]

A review and discussion.

New England J. of Med. 1956, Jan. 5 & 12, v. 254, Nos. 1 & 2, 20–25; 64–7. **Treatment of Leprosy. I. Chemotherapy** [Doull, J. A. & Wolcott, Rolla R.]. 20–25. [24 refs.] **II. The Role of Surgery** [Brand, P. W.]. 64–7. [16 refs.]

Two short reviews are given of treatment of leprosy, the first dealing with the chemotherapeutic improvements of recent years, and the second with the rôle of surgery, particularly in treating deformities and restoring lost function.

I. In connexion with chemotherapy there is particular interest in certain controlled experiments which were carried out under the Leonard Wood Memorial Scheme [this *Bulletin*, 1955, v. 52, 1097]. In Japan, the Philippines and South Africa groups of patients were placed on: (1) Diasone, (2) DDS, (3) dihydrostreptomycin, (4) dihydrostreptomycin and Diasone, and (5) dihydrostreptomycin with PAS. It was concluded as the result of 48 weeks' trial that the first 3 were of about equal value. The results were disappointing in that the 2 combined treatments offered no advantage. Three other groups were placed on: (1) Diasone, (2) isoniazid and Diasone, and (3) isoniazid and dihydrostreptomycin. After 1 year the results were similar as regards both clinical and bacteriological results.

The results with Amithiozone (TB 1/698), BCG in treatment of lepromatous cases, and cortisone and corticotrophin in lepra reaction, are also reviewed, but nothing new is mentioned.

II. Dr. Brand describes his rehabilitation centre for deformed patients. He describes the way in which wounds heal after tendon suturing and grafting, often more satisfactorily than in healthy persons. "This success is probably due in part to the fact that postoperative exercises are not inhibited by pain." [For a description of Dr. Brand's plastic work see this *Bulletin*, 1953, v. 50, 950.] *Ernest Muir*

DAVEY, T. F. **Experience with "Avlosulfon" Soluble.** *Leprosy Review*. 1956, Jan., v. 27, No. 1, 6–18.

This substance, a 40 per cent. w/w aqueous solution of N:N′diethyl-4:4′ diaminodiphenyl sulphone-a:a′ disulphonate, is freely soluble in water and breaks down rapidly in the body to release half its weight of DDS. Its injection caused a peak concentration in the blood within 2 hours considerably higher than that attained with a corresponding dose of DDS given orally: but after 72 hours the level was only 0·1 mgm. per cent.

In 4 tables the concentration obtained with Avlosulfon Soluble in the blood and urine are compared with those obtained with DDS. With the former the discrepancy between total sulphone and that extractable by benzene is very noticeable. This substance was tested in 24 patients with leprosy: 4 moderately advanced lepromatous, 9 early lepromatous, 8 tuberculoid, 1 indeterminate, 2 borderline. The results obtained were very similar to those obtained with DDS, and the amount of erythema nodosum was also very similar. These results were given when Avlosulfon Soluble was administered only twice weekly and the level of total sulphone in the blood for the greater part of each week was below 0·3 mgm. per cent. "If an effective low concentration in the blood is the only factor responsible, the rapid response of our patients to 'Avlosulfon' treatment is surprising. It is probable that some other factor is involved." It is suggested that virtue may exist in the periodic hammer-like action of the brief phases of high blood sulphone concentration. A third possibility is considered: if water-soluble metabolites, active in low concentration, are readily synthesized from Avlosulfon Soluble a ready explanation would be forthcoming for its activity when administered twice weekly.

The conclusion is that the results obtained with Avlosulfon Soluble are very similar to those with DDS. Four patients intolerant of DDS orally were put on Avlosulfon, but after a time they became intolerant of this drug also, and it was found that 3 of them continued to improve on minute doses of DDS, while the 4th resumed DDS treatment after corticotrophin and a period of rest. *Ernest Muir*

Gross, G. W. Chirurgie und Tropenkrankheiten mit besonderer Berücksichtigung der Lepra. [**Surgery and Tropical Diseases, with special reference to Leprosy**] *Deut. med. Woch.* 1956, Feb. 3 & 10, v. 81, Nos. 5 & 6, 170–73; 202–6, 6 figs. [Numerous refs.]

Mudrow-Reichenow, L. Die Rattenlepra als chemotherapeutisches Testobjekt. [**Rat Leprosy in Chemotherapeutic Research**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Dec., v. 6, No. 4, 460–72. [Numerous refs.]

The English summary appended to the paper is as follows:

"Research work done on rat leprosy with the object to discover efficient chemicals against human leprosy is reviewed, its development and technique described. The belief in a close relationship of the Hansen and Stefanski bacilli, based on criteria of structure and biologic behavior, has always been open to doubt and was definitely shattered by experiments with isonicotin hydracid which showed widely divergent effects on manifestations of human and rat leprosy. It is concluded that experiments on rat leprosy are of limited value and should be appraised with caution when testing chemotherapeutics destined for human leprosy."

HELMINTHIASIS

*In this section abstracts are arranged as far as possible in the following order:—*Trematodes *(schistosomes, other flukes);* Cestodes *(Diphyllobothrium, Taenia, Echinococcus, other cestodes);* Nematodes *(Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.).*

Deschiens, R. Les nouvelles médications anthelminthiques intéressant la gastro-entérologie. [**New Anthelmintics in Relation to Gastro-Enterology**] Reprinted from *Gaz. Méd. de France.* 1955, Nov. 1, 1507–16. [43 refs.]

Shah, S. N.; Gadgil, R. K. **Human Schistosomiasis in India. Part I. The Study of Snails** [Shah & Gadgil]. *Indian J. Med. Res.* 1955, Oct., v. 43, No. 4, 689–94. **Part II. Infection of Snails with** *Schistosoma hematobium* [Gadgil & Shah]. *Ibid.*, 695–701. [11 refs.] **Part III. Note on the Clinical Survey of the Endemic Focus** [Shah & Gadgil]. *Ibid.*, 703–6, 3 figs. on 2 pls.

I. An endemic focus of urinary schistosomiasis in India was described by these authors in 1952 [see this *Bulletin*, 1953, v. 50, 317]. The

present papers report the results of an investigation in the affected village. Three species of snails were found on surveying the stream running through it, *viz.*—*Paludomus obesa*, *Ferrissia tenuis* and *Indoplanorbis exhustus*. No living specimens of the last were collected but some shells were found in the fields during the monsoon only. The snails of the first two species and the area in which they were found are described. Attempts were made to breed both species in the laboratory; a colony of *F. tenuis* was established but no breeding of *P. obesa* occurred, though the snails could be maintained alive.

II. This paper describes the habitat in which the snails were found and the experimental infection of local snails with *Schistosoma haematobium*. The flow of water in the stream during the monsoon is considerable and snails are scanty. *P. obesa* begins to breed in November or early December and *F. tenuis* appears in December and begins to breed in January. The latter species is much more numerous than the former. The stream is used by the village inhabitants as a water supply and for washing when the wells become dry after the monsoon. Transmission of schistosomiasis begins in March and continues for about 3 months when the monsoon brings it to an end.

Laboratory infection of snails was attempted with *S. haematobium* ova from a local active case and wild and laboratory-bred snails of the following species: *Planorbis helisoma*; *P. torquis*; *F. tenuis*; *Indoplanorbis exhustus*; *Lymnaea luteola*; and wild specimens of *P. obesa*. Miracidial attraction was noted only in the case of *F. tenuis* and in this species alone were sporocysts and brevifurcate cercariae found following exposure to *S. haematobium* ova. It is concluded that *F. tenuis* is the probable intermediate host of the parasite but final proof has still to be provided by recovery and identification of adult worms from experimentally infected animals.

III. A clinical survey for urinary schistosomiasis was carried out among the 603 inhabitants of the village, Gimvi, in the Ratnagiri district south of Bombay, in which the disease is endemic. The number of persons giving a history of haematuria was 278 and this symptom occurred most commonly in the first decade. There were no cases with active haematuria in those aged over 20 years. Clinical evidence suggested that the disease had existed in the area for 75 years or more. Stones, papillomata or cancer in the bladder were not observed, nor was there any history of these. The disease appeared to run a benign, self-limiting course. Cystoscopy in 3 cases revealed the characteristic signs of infection; in one case pyelography showed dilatation of the ureters and renal pelvis. Ova of *S. haematobium* were seen in the urine of a number of active cases but were absent from 30 stools examined. Intradermal injection of cercarial antigen into 60 children gave a positive reaction in all active cases.

T. H. Davey

Mozley, A., **Sites of Infection. Unstable Areas as Sources of Parasitic Diseases: Schistosomiasis and Fascioliasis.**

This book was reviewed on p. 260.

Romanowski, V. **Bilharzial Ulcer of the Bladder: Report of a Case.** *West African Med. J.* 1955, Dec., v. 4 (n.s.), No. 4, 206–7.

A record of a Nigerian patient suffering from retropubic pain who had previously been treated for schistosomiasis without benefit. Cystoscopy did not show characteristic lesions; as the condition was regarded as being possibly tuberculous a course of streptomycin was given. The pain became extremely severe; a suprapubic exploration of the bladder was undertaken; biopsy of a lesion found on the upper posterior wall of the bladder yielded *Schistosoma haematobium* eggs. These were subsequently also recovered in small numbers from the urine. Severe abdominal pain, as seen in this case, is unusual in vesical schistosomiasis in the author's experience of the disease in N. Nigeria.

A. R. D. Adams

Higginson, J. & de Meillon, B. *Schistosoma haematobium* **Infestation and Hepatic Disease in Man.** *Arch. Pathology.* 1955, Sept., v. 60, No. 3, 341–6, 6 figs. [16 refs.]

There is marked diversity of opinion on the relationship between parasitic infections of the liver, including schistosomiasis, and disorders of the liver such as periportal fibrosis, cirrhosis, and primary hepatic carcinoma. The authors cite references in relation to schistosomiasis illustrative of this. They consider that in arriving at their varied conclusions, previous workers have rarely distinguished between heavy and light worm infections. They themselves in Johannesburg have examined material obtained at autopsy from 243 Bantu patients from the urban area of the city. Schistosomal infections, when found, presumably had been acquired elsewhere, as infection in the immediate locality is most improbable; both *Schistosoma haematobium* and *S. mansoni* infections were encountered, but the former predominated. Diagnosis of the infection was made by digestion overnight of the rectum and bladder, and of the female genitalia, in caustic soda, and search for eggs in the digest. In the case of 94 consecutive subjects 500 to 600 gm. of liver were also digested, and thereafter similarly searched for ova. In all cases where infection was found its intensity was low. The presence of schistosome ova, as disclosed by these investigations, was examined in relation to the presence or absence of liver fibrosis, cirrhosis, and primary hepatic carcinoma; the results are set out in a series of tables. No significant correlation between these liver conditions and a schistosomal infection could be discerned.

A. R. D. Adams

Halawani, A., Shaker, M. H., Abdalla, A. & Saif, M. **Sulphaemoglobinuria during Administration of Stibophen.** *Lancet.* 1956, Jan. 28, 190.

Suspecting that some factor other than heart failure might explain the sudden (and usually fatal) collapse which sometimes occurs during the treatment of schistosomiasis with antimonial compounds the authors, from Cairo, studied blood-antimony levels in a series of patients who had died in these circumstances. No rise in antimony levels was found. They now report a case in which collapse occurred in a patient with *Schistosoma haematobium* infection on the eighth day of daily treatment with 3·75 ml. of a 6 per cent. solution of stibophen (Foudin, Repodral) intramuscularly: he had not complained of any side-effects. Full clinical and laboratory details are given. The picture was one of severe shock with acute intravascular haemolysis. Spectroscopy of the urine revealed sulphaemoglobin and oxyhaemoglobin, which did not clear completely until the ninth day, and the urine did not become free of casts and urobilinogen for a month.

The condition was not related to any known haemoglobinurias (malaria parasites were absent) and the explanation offered is the possible action of the sulphonic group in the stibophen on a susceptible person.

The patient also had a patch of pneumonic consolidation, which sometimes occurs during treatment for schistosomiasis and has been attributed to disintegration of the worms.

The patient had not recently had any drug treatment which would account for the condition, though he had had stibophen a year before and tartar emetic 5 years earlier.

The authors have found that stibophen is liable to dissociate and become toxic as a result of prolonged storage.

They add that they have since seen two more cases of haemoglobinuria developing during stibophen treatment, but no details are given.

H. J. O'D. Burke-Gaffney

Dias, E. & Dawood, M. M. **Preliminary Trials of " B E T " on killing the Snails of Egypt.** *J. Egyptian Pub. Health Ass.* 1955, v. 30, No. 1, 9–22.

This paper appears to recapitulate the information previously reported [see this *Bulletin*, 1956, v. 53, 213] concerning the culture of *Bacillus pinottii* [referred to throughout this paper as BET—*bacilo de esporo terminal*], the methods of application of cultures for snail control purposes and the results obtained in laboratory and small field experiments. It is further reported that the organism has been recovered from the ovitestis of living Egyptian *Planorbis* [*Biomphalaria*] *boissyi*. [It is not clear whether this infection was autochthonous or experimental.] The organism survives heating to 80°C. for 10 minutes, by which means it

can be recovered from mixed cultures. The appearance of the bacillus and some of its cultural characteristics are described. *T. H. Davey*

Paraense, W. L. & Deslandes, N. **Studies on** *Australorbis centimetralis*. **I. Morphology, in Comparison with** *A. glabratus*. Reprinted from *Rev. Brasileira Biologia*. 1955, Sept., v. 15, No. 3, 293–307, 28 figs. [10 refs.]

This is a further contribution to the study of the morphology of S. American fresh-water molluscs [see also this *Bulletin*, 1956, v. 53, 208 *bis.*]. Of 302 specimens of *A. centimetralis* collected in the State of Minas Gerais, Brazil, none was found to exceed 11 mm. in diameter. Fifty 9 mm. specimens of this species and 50 of *A. glabratus* were selected for detailed comparative examination of shell and internal morphology. The highly detailed account of the comparative anatomy should be studied in the original, but the chief specific differences separating *A. glabratus*, *A. nigricans* and *A. centimetralis* may be summarized as follows:

	A. glabratus	*A. nigricans*	*A. centimetralis*
Shell	Smooth Relatively narrow	Carinate Wide	Smooth Relatively narrow
Renal Region	Ridged Pigmented line in small specimens	Smooth Unpigmented	Smooth Unpigmented
Vaginal wall	Smooth	Smooth	Corrugated

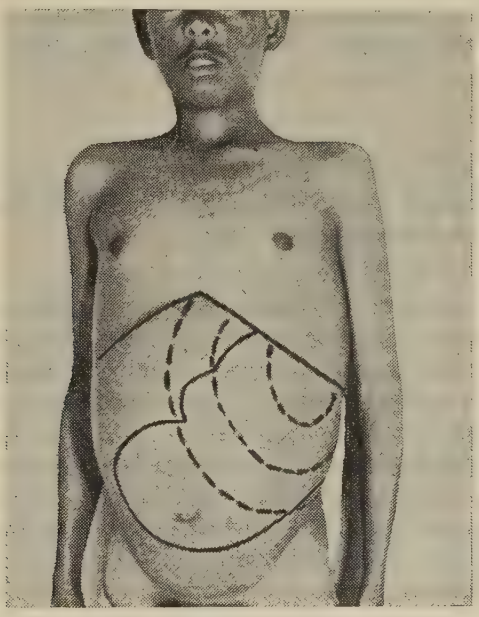
In addition of these main features, *A. centimetralis* can be distinguished by the character of the ovotestis, sperm duct, prostate and vergic sac and by the length of the penial complex and uterus.

O. D. Standen

Versiani, O. Mensuração do baço na esquistossomíase. [**Mensuration of the Spleen, with special reference to Schistosomiasis**] *Brasil-Médico*. 1955, Sept. 3–24, v. 69, Nos. 36/39, 540–42, 5 figs.

The advocated methods for measuring the spleen size suffer from various defects. The position of the umbilicus, for example, varies with the contours of the abdomen. The author, therefore, determines as a

standard the distance between the extremity of the tenth left rib and the right anterosuperior iliac spine; he draws with compasses a series of arcs from the former point with a radius of one-sixth this standard and multiples of this fraction of the radius, and determines the degree of splenic enlargement in relation to these arcs. The use of compasses



facilitates measurement, and it eliminates errors due to curvature of the abdomen. A normal spleen is impalpable; the apex of a spleen I lies between the costal margin and the first arc; that of a spleen II between the first and second arcs; and so forth. The practical application of the method is illustrated by photogravures, one of which is reproduced here.

A. R. D. Adams

Guimarães, N. A., Aguiar, O. G. & Carneiro, C. G. Pruridermias e parasitoses intestinais. 1—Pruridermias e esquistossomose. [**Pruritic Dermatitis and Schistosomiasis**] *Bol. Hosp. Clin. Facul. Med. Univ. Bahia.* 1955, Aug., v. 1, No. 3, 1–8.

The English summary appended to the paper is as follows:—

"The authors present the preliminary results of a work on the influence of intestinal parasites as the cause of cutaneous eruptions by means of a mechanism of allergic sensitization.

"The present paper deals with the relations between schistosomiasis (S. mansoni) and dermatoses of the 'pruridermiae' group. Twelve cases are presented which have been previously submitted without any results to all advisable dermatological medication. S. mansoni eggs were detected in the stools of these patients and an intradermal test performed

with the corresponding antigen was positive. The treatment of the intestinal parasite was then instituted and was followed in all of the cases by considerable improvement, which ended by complete cure in five of them."

DA MOTA, J. N. Tumor do ceco por esquistossomose. [**Schistosomal Tumour of the Caecum**] *Rev. Assoc. Méd. Minas Gerais.* 1954, Apr.–Aug., v. 5, Nos. 1/2, 69–70.

OLIVER-GONZÁLEZ, J., RAMOS, F. L. & COKER, C. M. **Serological Reactions against Egg Antigens as an Aid in the Evaluation of Therapy in Schistosomiasis.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 908–12.

The presence or absence of viable ova in the faeces or in the snips of rectal mucosa taken by biopsy from the human host is frequently used to estimate the effectiveness of some particular form of therapy used in the treatment of schistosomiasis. Such examinations to be reliable should be continued for 6 months after the cessation of treatment. In previous years [this *Bulletin*, 1955, v. 52, 459, and *Amer. J. Trop. Med. & Hyg.*, 1955, v. 4, 443] it was claimed that the " antibodies produced against the eggs of the human schistosome offer simpler and more accurate methods of evaluating therapeusis than the above-mentioned techniques ". The authors also noted that persons with active schistosomiasis gave negative skin reactions to egg antigen but that the reaction became positive in treated cases. " The present paper is the result of further study on the possible use of both these tests in the evaluation of the treatment of schistosomiasis."

The authors' summary is as follows:—

" Fifteen individuals infected with *Schistosoma mansoni* received daily intramuscular injections of 5 cc. of Fuadin until toxic reactions to the drug made it necessary to give this amount on alternate days. The treatment was continued until a total of 100 cc. had been given. The sera from these patients were tested for circumoval precipitins before and at regular intervals after therapy. For comparison seven untreated cases were given similar tests. The circumoval test became negative in 13 of the sera tested between the 120th and 183rd days of observation. It is believed that the two cases that remained positive represented treatment failures. The sera of the seven untreated patients remained positive throughout the period of study.

" The skin reaction to antigens prepared from schistosome eggs were negative before treatment but became positive in 11 of 14 patients tested 183 days after therapy. Positivity was first manifested on the 150th day after treatment. The observations indicate that the circumoval precipitin content of sera and the skin response to egg antigen are inversely altered

as a consequence of treatment. The results of the former are believed to indicate that all but two patients were cured with Fuadin. The change from negative to positive skin reaction observed in 11 out of 14 patients is suggestive of some action by the drug which sets up skin sensitization but not necessarily that treatment was successful.

" The most important toxic reactions caused by treatment were loss of weight, anorexia and vomiting. These reactions, however, did not warrant discontinuation of the drug." *R. M. Gordon*

Seneca, H. & Bergendahl, Ellen. **Toxicity of Antibiotics to Snails.** *Antibiotics & Chemotherapy.* New York. 1955, Dec., v. 5, No. 12, 737–41.

" Thiolutin is a potent molluscacide in a dilution of 1 to 4 million or 0·25 μg./ml. in 12 hours, in a dilution of 1 to 16 million or 0·06 μg./ml. in 24 hours, and partially active in a dilution of 1 to 32 million or 0·03 μg./ml. [incorrectly shown in summary as 0·003 μg./ml.] in one week. Rimocidin is lethal in a dilution of 1 to 256,000 or 3·9 μg./ml. in 24 hours; anisomycin, in a dilution of 1 to 160,000 or 6·25 μg./ml. in 48 hours; and nystatin, in a dilution of 1 to 64,000 or 15·6 μg./ml. in one hour. The other 10 antibiotics had very low toxicity.

" It is suggested that *A. glabratus* may be used for the initial screening of the toxicity of antibiotics."

Daugherty, J. W. **The Effect of *Schistosoma mansoni* Infections on Liver Function in Mice.** *Amer. J. Trop. Med. & Hyg.* 1955, Nov., v. 4, No. 6, 1072–9.

The first part of a study on the physiological effects of schistosomiasis was reported earlier [this *Bulletin*, 1954, v. 51, 1176]. The present study deals with the effect of schistosome infection on respiration of liver tissue and the possible production of a toxic substance. For this purpose the activity of succinic oxidase and dehydrogenase as well as cytochrome c content of normal and infected livers was compared, and other metabolic effects were studied. The liver tissue was obtained from mature mice infected with both sexes of *S. mansoni* which were sacrificed at 6 or 7 weeks after infection. The endogenous respiration of liver tissue was measured in phosphate-buffered saline in Warburg flasks at 38°C. with the addition of various substrates such as glucose, pyruvate or succinate. It was found that the respiration of infected tissue differed but little from that of normal tissue, but in the presence of succinate the oxygen uptake by infected livers was smaller. The scarring which occurs in infected livers led the authors to compare their collagen content with that of normal livers; in infected livers the collagen was increased. The

marked pigmentation in heavily infected mouse livers was possibly due to melanin; however, the tyrosinase activity of infected mouse liver appeared to be unaltered. Because of the reported alterations in blood sugar level during infection the glycolytic powers of the liver were measured and found to be somewhat reduced. *J. D. Fulton*

Evans, A. S., Stirewalt, M. A. & MacKenzie, Maxime. **Serologic Reactions in *Schistosoma mansoni* Infections. II. Cercarial Behavior in Electrophoretically Separated Fractions of Sera of Infected and Uninfected Mice.** *Exper. Parasit.* New York. 1955, Sept., v. 4, No. 5, 419–26, 4 figs. [11 refs.]

In a previous paper by Stirewalt and Evans [this *Bulletin*, 1955, v. 52, 993] the various effects, *in vitro*, of normal sera and of antisera on schistosome cercariae were evaluated. The results of this investigation suggested that several serum factors might be involved and, in consequence, the attempts, described in the present paper, were made to correlate " cercarial behaviour patterns " with specific electrophoretically separated fractions of serum.

The authors' summary is as follows:—

" Sera from mice with *Schistosoma mansoni* infections of long duration and control uninfected mice of similar age were separated by moving boundary electrophoresis and photographs were made using the Schlieren scanning method. Samples were withdrawn from the electrophoresis cells at increasing depths from the salt boundaries.

" Six components were identified in uninfected serum with mobilities similar to albumin, alpha$_1$, alpha$_2$, beta$_1$, beta$_2$, and gamma globulins.

" In infected mouse serum, albumin, and alpha globulin areas were reduced and the beta area increased relative to uninfected mouse serum.

" The alpha$_1$ and alpha$_2$ peaks of uninfected mouse serum appeared as a single peak in infected mouse serum.

" Cercarial behavior was observed in eight globulin samples. The first and second samples below the epsilon boundary were effectively cercaricidal in both uninfected and infected mouse serum. Succeeding samples through the fifth were progressively less so. Beyond the fifth, no cidal activity was observed. Pericercarial envelopes were formed only in the third, fourth, and fifth samples of infected mouse serum. It was concluded from these findings that the first or ' gamma ' sample of infected mouse serum contained the factors responsible for both cercaricidal activity and pericercarial envelope formation and that the third or ' alpha ' sample introduced a cercaricidal inhibitor which thus made it possible for the cercariae to form envelopes. Envelopes were found, therefore, only in those infected serum samples which contained both gamma and alpha globulins or serum components with similar mobilities."

[To the abstracter the results recorded in this paper appear to have a

very important practical bearing on our understanding of the various serological tests which have previously been described as means of recognizing the development of antibodies to certain schistosome parasites.] *R. M. Gordon*

Kagan, I. G. **Hemagglutination after Immunization with Schistosome Antigens.** *Science.* 1955, Aug. 26, v. 122, 376–7. [10 refs.]

"Hemagglutination titers were obtained for the serums of 16 rabbits immunized by six intravenous injections administered twice weekly for 3 wk with various stages of the life-cycle of *S. mansoni* and *Schistosomatium douthitti* . . . , and for the serums of six hosts immunized twice weekly for 3 wk with various doses of frozen cercariae of *S. mansoni.*" The haemagglutination titre resulting from the injection of these various antigens varied from negative, following the injection of 1,900 living miracidia of *S. douthitti*, to positive at a dilution of 1 in 640, following the injection of 14·4 ml. 1:100 by weight of mouse spleen containing many eggs of *S. douthitti.* *R. M. Gordon*

Luttermoser, G. W., Bond, H. W. & Sherman, J. F. **Chemotherapy of Experimental Schistosomiasis. IV. Oral Activity of Antimony Trichloride Antibiotic Complexes.** *Proc. Soc. Exper. Biol. & Med.* 1955, Oct., v. 90, No. 1, 122–4. [11 refs.]

Originally the most successful drugs in treatment of schistosomiasis contained antimony and included tartar emetic, Fuadin and others. More recently non-metallic compounds such as Miracil and a series of diaminodiphenoxyalkanes have been used with some success. During screening procedures [this *Bulletin*, 1955, v. 52, 177] for schistosomicidal substances in mice it was found that complexes of antimony trichloride and antibiotics such as oxytetracycline (Terramycin) chlortetracycline (Aureomycin) and tetracycline were effective when given by mouth. The tests were then extended by twice daily oral administration of the drugs over a period of 5 days to batches of 5 or 6 mice 35 days after exposure to about 300 cercariae of *S. mansoni.* Two or three weeks later the animals were killed, the portal system perfused and schistosomes counted. Liver preparations were also examined for worms. Untreated animals were examined by the same procedure, and Fuadin, tartar emetic, as well as other antimony compounds were used as reference compounds in treatment.

The toxicity and therapeutic activity of the compounds used are conveniently summarized in a table. Complexes of antimony trichloride with antibiotics appeared to be active owing to the antimony present, as the antibiotics were themselves inactive. The 3 complexes also possessed

activity when given subcutaneously or intraperitoneally, but were much more toxic by these routes. Their activity did not exceed that of tartar emetic or antimony trichloride. *J. D. Fulton*

STANDEN, O. D. **The Progress of Degenerative Changes in Schistosomes following the Treatment of Experimental Infections with 1:7-bis (*p*-Dimethylaminophenoxy) Heptane.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 416–23, 4 pls.

In previous papers [this *Bulletin*, 1955, v. 52, 997] the author described the results of biological tests of some hundreds of diphenoxyalkanes found to be active against schistosomes in experimental animals. The results of further tests of one of these drugs—1:7-bis(*p*-dimethylaminophenoxy) heptane are described in the present paper.

One hundred and twenty mice infected with *Schistosoma mansoni* were given 100 mgm./kgm. of the drug in a single oral dose 70 days after exposure to infection. "The dose was given in the afternoon, and autopsies in groups of 10 mice were made each morning for 11 days following treatment. Each day, careful study was made of the worm distribution within the hepatic portal vessels, the numbers of worms of each sex, the activity and condition of the worms, differences in drug action against male and female worms, the onset of inflammatory action around worms shifted to the liver, the number and condition of ova in the faeces and the viability of ova in the liver as determined by hatching tests. Worms taken from the mesenteric, portal and intrahepatic veins were examined in warm Ringer solution to note their degree of activity. They were then fixed in 10 per cent. formol saline and stained in haematoxylin. At autopsy, the liver of one mouse from each group was set aside for hatching tests and the contents of the rectum from the same animal were examined for *S. mansoni* ova. In preparation for hatching tests, the livers were chopped finely and ground gently with a little sand, to form a paste. This material was subjected to repeated sedimentation in cold saline and subsequent stimulation in fresh water at 28°C under bright light. The faecal contents of the rectum were examined on five slides, using $1\frac{1}{2}'' \times \frac{7}{8}''$ coverslips. The ova were counted and their viability was determined by the presence of flame-cell movements in the contained miracidia." The author also records the histological and other findings observed in a guineapig which was treated with the same drug and in the mesenteric veins of which a group of *Schistosoma japonicum* was found ensheathed.

The summary is as follows:—

"(1) Using 1:7-bis(*p*-dimethylaminophenoxy) heptane the progressive degenerative changes in *S. mansoni* and *S. japonicum* have been described.

"(2) Following a large single oral dose the greater part of the hepatic shift is achieved in 3 days.

" (3) Depigmentation of the worms is a direct result of drug action but is not related proportionately to degree of drug activity.

" (4) Female worms disintegrate more rapidly than males.

" (5) Males and females, previously *in copula*, tend to separate after drug treatment. This is probably associated with loss of muscle tone in the male and is somewhat haphazard.

" (6) The drug has no apparent effect upon the viability of schistosome ova present in the intestinal or hepatic tissues at the time of treatment but has a marked effect upon the egg-laying of the schistosomes themselves.

" (7) Affected schistosomes are rendered immobile and stimulate foreign-body reactions in the liver or, more rarely, in the mesenteric veins. Worms thus ensheathed in inflammatory tissue are invaded by phagocytes and destroyed piece-meal. The narrower anterior and posterior tips of the worms are the last to be affected.

" (8) The relative activity of schistosomicides is probably related to the degree of immobility conferred and the time required for foreign-body reactions to develop.

" (9) That *S. japonicum* may be destroyed *in situ* in the mesenteric veins suggests the possibility that *S. haematobium* in man may be destroyed in the pelvic veins as a result of successful treatment."

[This paper contains information based on a large number of careful and detailed observations and should be consulted in the original by those interested in the subject.] *R. M. Gordon*

Yoshizumi, Y., Kuroda, I., Watanabe, H. & Oda, T. **Further Observations of Schistosomiasis japonica by Needle Biopsy of the Liver (Fresh Liver Slide Method).** *Kurume Med. J.* 1955, v. 2, No. 1, 63–75, 11 figs.

The senior author has already shown the value of a simple examination of liver biopsy material for *Schistosoma japonicum* eggs [this *Bulletin*, 1955, v. 52, 662]. Using this technique between July 1954 and March 1955, the present authors have examined material from 113 patients from endemic areas of Far Eastern schistosomiasis. The broad facts and findings are set out in lengthy tables; and 3 cases are described in greater detail in the text as examples of those in which the diagnosis was established by this technique after failure by other methods. Of the 113 patients examined 68 (60·2 per cent.) yielded eggs by the liver biopsy technique where none could be found in the stools; in only 13 cases (11·5 per cent.) of the total did the liver examination fail to yield eggs while the faeces did so.

This method is to be recommended in the examination of patients with fever and indefinite symptoms from a schistosomiasis endemic area. It is safe, simple and effective. *A. R. D. Adams*

Ito, J. **Studies on the Host-Parasite Relationships of *Schistosoma japonicum* in Common Laboratory Animals.** *Japanese J. Med. Sci. & Biol.* 1955, Feb., v. 8, No. 1, 43–62, 3 text figs. & 16 figs. on 2 pls. [28 refs.]

Fifteen rabbits, 9 albino mice, 29 guineapigs and 29 albino rats were infected by the intraperitoneal injection of the cercariae of *Schistosoma japonicum*. At various periods up to 60 weeks after exposure to infection, the animals were killed and examined. The number of cercariae injected and the number, sex and anatomical sites of invasion by the worms were recorded and are shown in the paper in tabulated form. In addition, the authors describe the histology of the lesion produced, as observed in different animal hosts. In general it may be stated that rabbits prove the most satisfactory hosts since they showed the highest infection rate associated with the longest survival time of the worms, as evidenced by the presence of eggs in the faeces. *R. M. Gordon*

Fain, A. Une nouvelle bilharziose des oiseaux: La trichobilharziose nasale. Remarque sur l'importance des schistosomes d'oiseaux en pathologie humaine. Note préliminaire. [**Nasal Trichobilharziasis, a New Schistosome Infection in Birds. Pathological Significance of Avian Schistosomes in Human Medicine**] *Ann. Soc. Belge de Méd. Trop.* 1955, June 30, v. 35, No. 3, 323–7.

The author found 7 new species of schistosomes in aquatic birds in Ruanda-Urundi during 1954 and 1955. Four of these species were located in the mesenteric veins and 3, all belonging to the genus *Trichobilharzia*, were found only in the veins of the nasal fossa, which is an entirely new habitat for these schistosomes in birds.

Of these 3 new species of *Trichobilharzia*, 2 occurred in anseriform birds which are common in the Belgian Congo, namely, *Anas undulata undulata* (13 out of 15 infected), *Alopochen aegyptiacus* (4 out of 5) and *Plectropterus gambensis* (1 examined). The third was found in a ciconiform bird, *Hagedashia hagedash*. These parasites appear to be specifically parasitic in the nasal organs, and even in heavily infested birds they were not found in the liver or mesenteric veins. The eggs are large (0·3 mm.) and the infection is easily diagnosed by finding them in the nasal mucous discharge.

The parasitological significance of these findings and the association of cercariae of *Trichobilharzia* with swimmer's itch are discussed.

J. J. C. Buckley

Kulka, F. & Barabás, M. **Clinical Aspects and X-Ray Diagnosis of Paragonimiasis.** *Acta Med.* Budapest. 1955, v. 7. Nos. 3/4, 371–90, 12 figs. [10 refs.]

Paragonimiasis may be a pulmonary or an extrapulmonary infection; the latter form is rare, 2 per cent. of 247 cases in the authors' series, and is probably secondary to the pulmonary infection.

Males constituted 65 per cent. of the series. The ages of the patients varied from 5 years to 54 years; the numbers of cases in the first four decades were 4, 77, 48 and 39, respectively, and 27 patients were over 40; from this series 2 cases were excluded.

Rusty sputum was the most common sign and was observed in all but 3 cases. The cough "is dry and causes much discomfort to the patient"; it occurs mainly in the morning, but in advanced cases it continues all day. Fever does not occur except in the presence of complications.

Chronic bronchitis was a constant complication, haemoptysis occurred in 26 per cent. of cases and spontaneous pneumothorax in only one case. Pleurisy is a frequent complication but pneumonia and lung abscess are rare [figures are not given]. Tuberculosis was diagnosed in 6 cases.

Ova were found in the sputum in every case; they were also found occasionally in the gastric juice and in the faeces, but in the latter adult worms were found (in 6 cases) especially after treatment and purgation.

The erythrocyte sedimentation rate was not as markedly increased as in other inflammatory conditions of the lung.

In the opinion of the authors the X-ray picture is very characteristic. The typical lesion is a ring shadow surrounded by relatively unchanged tissue; it is usually 5 to 10 mm. in diameter but may be from 15 to 20 mm. In the majority of cases it is basal (3 to 5 cm. above the diaphragm) but it may be infraclavicular; in this last group the author includes lesions in the central zone. The lesions may be single or multiple; in the latter case the majority are basal and they diminish in numbers from the diaphragm upwards. A third type is the disseminated type which "resembles most closely the pattern seen in pulmonary tuberculosis". However, in this type the majority of the lesions are basal and very rarely apical.

Pleuritic lesions, especially diaphragmatic pleuritis, are common accompaniments and are clearly shown by X-ray.

The treatment given was emetine (30 mgm.) intravenously, and Ultraseptyl [sulphamethylthiazole] and Transpulmin [camphor and quinine in oily solution] intramuscularly for 7 days. [The dosage of the latter is not stated.] In 46 cases, "sputum or haemoptysis ceased" and subjective complaints subsided, in 44 the sputum decreased and symptoms ceased or improved; in 30 there was no change; and in 1 case deterioration occurred.

In 25 cases, 20 mgm. of emetine and 0·5 ml. of 4 per cent. sodium nitrite were given intrapleurally on 3 consecutive days; in 10 cases the procedure failed on account of pleural adhesions, in 9 cases sputum and symptoms ceased, in 4 they lessened, and 2 cases there was no change.

L. E. Napier

Kay, S. *Paragonimus westermani* **Infestation involving the Anterior Abdominal Wall. Report of a Case simulating Acute Appendicitis.** *J. Amer. Med. Ass.* 1955, Dec. 31, v. 159, No. 18, 1734–6, 3 figs.

"In a case of Paragonimus westermani infestation involving the anterior abdominal wall the patient had a simulated attack of acute appendicitis necessitating abdominal exploration. A poorly circumscribed mass was found in the anterior abdominal wall, which on removal was found to consist of a granulomatous abscess caused by the ova of Paragonimus westermani. The patient has been entirely free of symptoms after surgery, and follow-up studies of stool specimens have revealed no ova of Paragonimus."

[See this *Bulletin*, 1926, v. 23, 754; 1932, v. 29, 47; 1935, v. 32, 253; 1940, v. 37, 153.]

Mazzotti, L. *Lymnaea obrussa* Say, huésped intermediario de *Fasciola hepatica*. [*Lymnaea obrussa* **as an Intermediate Host for** *Fasciola hepatica*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, Sept., v. 15, No. 3, 163–5.

The English summary appended to the paper is as follows:—

"Specimens of *Lymnaea obrussa* were collected in Northern Mexico at water streams, near the villages of La Constancia and Nombre de Dios (Durango), as also at the Sabinas river, near the city of Sabinas (Coahuila).

"This species of *Lymnaea* proved experimentally to be susceptible to infection with *Fasciola hepatica*."

Tissier, M., Tauzin, J., Chicou, J. & Baudouard, Y. Pneumothorax spontané (2 cas) au cours d'une distomatose des voies biliaires à *Fasciola hepatica*. [**Two Cases of Spontaneous Pneumothorax during an Infection of the Biliary Tract with** *Fasciola hepatica*] *Maroc Méd.* 1955, Apr., v. 34, No. 359, 415–16.

Sadun, E. H. **Studies on** *Opisthorchis viverrini* **in Thailand.** *Amer. J. Hyg.* 1955, Sept., v. 62, No. 2, 81–115, 26 figs. [25 refs.]

This account of studies in Thailand on the human liver fluke, *Opisthorchis viverrini*, is concerned with 3 main aspects of the infection, namely, the parasite and its eggs, geographical distribution and epidemiology.

The parasite was identified as *O. viverrini* from studies of adult worms recovered from human beings and cats post mortem, and eggs collected from faeces. From observations on egg counts in 3 cats it was estimated that in an experimentally-infected cat each worm produced 900 eggs per

day. In one naturally infected cat this figure was 830 and in another 160; the worms in the latter were, however, largely immature.

The infection appears to be confined to the north of Thailand, and is especially heavy in the north-east region where it was found to be an important public health problem. Some 26,000 persons were examined for the presence of eggs in the stools, in all 4 regions, south, central, north and north-east. In the south and central regions only 2 out of 2,970 children were positive and these 2 had come from the north-east. In the north region, of 1,219 children examined, 3·8 per cent. were positive. In the north-east region, of 504 children examined, 29 per cent. were positive (11 to 66 per cent.). Thereafter this region was chosen for intensive studies. The infection rates in the different provinces proved to be as follows: Udorn, 55·2 per cent. out of 5,362 examined; Nakorn and Sakol, 47 per cent. out of 468; Korat 18·9 per cent. out of 2,122. Data as to intensity of infection (by egg counting), infection rates according to age and sex were collected and tabulated. Racial differences in infection rate were apparent between the Siamese and the Chinese, the latter being " almost free of the infection ". This is thought to be due to the fact that the Chinese cook fish thoroughly before eating it.

Cats and dogs are natural reservoir hosts in the areas of endemic human infection and also in the central region where human infection is absent.

" The earliest indications of illness were usually general malaise, abdominal discomfort, and occasional diarrhea. This was sometimes followed by pain at the site of the liver, transient urticaria, and jaundice. No marked eosinophilia was found to be associated with the infection. Liver cirrhosis and carcinoma of the bile ducts were often observed in the northeast. In 4 adult males infected with *Opisthorchis*, a diagnosis of carcinoma of the bile ducts was established. One of them at autopsy harbored 5,896 adult flukes. Whether or not the association between liver fluke infection and carcinoma of the bile ducts was a casual relationship could not be determined by the present studies."

After consideration of the various possibilities of controlling the infection at some point in the life cycle of the parasite, it is concluded that prevention of the eating of raw fish represents the only effective control measure. [For a similar survey of hookworm, *Ascaris* and *Trichuris*, see below, p. 625.] *J. J. C. Buckley*

Wells, W. H. & Randall, Beverley H. **Salted Mullet** (*Fessikh*) **as a Source of Human Infection with** *Heterophyes heterophyes*. *J. Egyptian Pub. Health Ass.* 1955, v. 30, No. 3, 83–6.

Heterophyes heterophyes is one of the commoner helminths of man in Egypt. The authors quote literature on its incidence, distribution and

intermediate hosts. They obtained 4 lots of salted, uncooked mullet (*fessikh*) from a Cairo shop and, after finding metacercariae of the fluke in this, gave it to 10 puppies born and reared in their laboratory. The puppies were autopsied 3 weeks later.

Adult flukes were found in each of the 10 puppies given *fessikh* that had aged in brine for 4 days, an average of 39 flukes being recovered from each puppy. Six of the 10 puppies given *fessikh* that had aged for 7 days were infected, an average of 13 flukes being recovered from each of them. Only 1 of the 10 puppies given *fessikh* aged 10 days was infected, only one fluke being found in it. None of the 10 puppies given *fessikh* aged 14 days were infected. Thus there was a gradual decrease in the number of viable metacercariae in *fessikh* progressively aged in brine and it appears that *fessikh* kept in brine for a minimum of 2 weeks is relatively safe for human consumption; but it is admitted that more extensive studies are needed. *G. Lapage*

I. Silverman, P. H. **Bovine Cysticercosis in Great Britain from July, 1950, to December, 1953, with some Notes on Meat Inspection and the Incidence of** *Taenia saginata* **in Man.** *Ann. Trop. Med. & Parasit.* 1955, Dec., v. 49, No. 4, 429–35, 1 fig.

II. ———— & Griffiths, R. B. **A Review of Methods of Sewage Disposal in Great Britain, with special reference to the Epizootiology of** *Cysticercus bovis*. *Ibid.*, 436–50, 5 figs. on 2 pls. & 2 text figs. [31 refs.]

I. Bovine cysticercosis was not noted in cattle slaughtered in Great Britain prior to the second world war but was recorded first in 1947 and regularly thereafter. This paper examines the figures of incidence compiled by the Ministry of Food between 1950 and 1953 when meat inspection findings ceased to be reported to the Government.

During these 3½ years the monthly incidence of cysticercosis, based on the total number of carcasses examined, ranged from 0·21 per cent. to 0·58 per cent. though the infection was reported from only 200 of the 500 abattoirs operated by the Ministry. The figures from 45 abattoirs in particular were studied because they maintained complete records and reported consistently high incidences. The average monthly infection rates at these were found to range from 0·81 per cent. to 3·47 per cent. and these rates are regarded as more nearly reflecting the true state of affairs than the national average. Cysticercosis was noted in cattle imported from Ireland but the survey indicated that it occurred also in home-bred cattle and in fact some infections were traced to their places of origin in England and Wales. In a substantial proportion of cases the heart alone was found parasitized and hence the importance of incising that organ during inspection is emphasized. The great majority of infections are light, close contact between infected human hosts and cattle is

unusual and there is little seasonal fluctuation in infection of cattle. The facts suggest perennial contact with a low density or wide dispersion of tapeworm eggs. Reports from the Central Public Health Laboratories indicate an average of 4 human tapeworm infections treated weekly in England and Wales.

II. Attempts to find the human sources of bovine cysticercosis have failed but circumstantial evidence suggests that *Taenia* ova by some means escape from sewage disposal plants and reach cattle. An investigation into this possibility is reported here. The literature concerning the ability of helminth ova to survive and remain infective after sewage treatment is reviewed, and the results of a survey of the common methods of sewage disposal in Britain are discussed. The opinion was formed that under modern conditions most urban and rural sewage treatment methods fail to retain tapeworm eggs which can probably survive in air-dried sludge and which remain viable in the final effluent. The recent introduction of rapid sand filtration of the final effluent is ineffective in removing *Ascaris* or *Taenia* ova but micro-straining methods appear to remove 99 per cent. or more of the former and some 90 per cent. of the latter. The investigation indicates that sedimentation of sewage is inhibited by disposal of detergents and other substances, that the volume of sewage for disposal per head has increased greatly and that the expansion of communities has outstripped that of the disposal plants thus reducing the detention time. Moreover, the increased volume of final effluent discharged into streams has resulted in a much lower degree of dilution. There is no evidence that increase of bovine cysticercosis has followed a greater incidence in human infection.

Birds commonly frequent sewage disposal works and outfalls, and their ability to excrete viable human tapeworm eggs after ingestion was investigated. Experiments with pigeons fed with gravid tapeworm segments were all negative but similar experiments with seagulls showed that viable eggs of *T. saginata* and *T. pisiformis* were excreted in the birds' faeces within about an hour of ingestion. It was thought that the absence of a crop in the seagull might explain the difference and feeding experiments were carried out on young and developing chicks. As the crop developed it became increasingly difficult to find eggs in the droppings.

The conclusion is reached that the gradual decline in the efficacy of formerly reliable sewage treatment systems has resulted in increasing numbers of viable tapeworm eggs from a small number of human tapeworm carriers passing into the effluents which contaminate streams and pastures and thus reach cattle. The rôle of birds in transmission cannot be assessed as yet.

[This is an important paper drawing attention to an infection which is a cause of considerable loss to the meat industry, and to a failure in sewage treatment which may yet prove of serious concern to the public

health. The need for a new consideration of sewage disposal methods under modern conditions is disclosed and an important field for investigation is indicated.] *T. H. Davey*

Silverman, P. H. & Maneely, R. B. **Studies on the Biology of some Tapeworms of the Genus *Taenia*. III.—The Rôle of the Secreting Gland of the Hexacanth Embryo in the Penetration of the Intestinal Mucosa of the Intermediate Host, and some of its Histochemical Reactions.** *Ann. Trop. Med. & Parasit.* 1955, Oct., v. 49, No. 3, 326–30, 9 figs. on 2 pls. [17 refs.]

To determine the nature and function of secreting glands in the hexacanth embryos of *Taenia*, two methods were employed, with embryos of the two species *T. pisiformis* and *T. saginata*. For histochemical studies on the embryos, gravid segments were fixed, and sectioned after embedding in paraffin wax. The gland substance did not stain with either methyl-green-pyronin or Masson's trichrome but reacted to the periodic-acid-Schiff (PAS) technique for polysaccharide complexes.

To study the mode of penetration of the mucosa by the embryos, several thousand embryos previously hatched were injected into half-inch lengths of duodenum and ileum from freshly killed mice. The pieces of gut were tied off and incubated for 5, 10, 20, 30, 40 and 80 minutes and then fixed and sectioned. Examination of these sections showed that the larva penetrates the intestinal mucosa between 10 and 40 minutes after being introduced into the lumen and that the gland of the larva plays an active part in the penetration.

The significance of the presence of polysaccharide complexes in the gland is discussed. *J. J. C. Buckley*

Watson, K. C. & Laurie, W. **Cerebral Coenuriasis in Man.** *Lancet.* 1955, Dec. 24, 1321–2.

Two cases of cerebral coenuriasis are reported from South Africa in a Bantu woman and a Bantu man.

The first of these had a 3 months' history of headache and neck stiffness. She died after 4 weeks in hospital. On post-mortem examination it was found that the " right cerebellar hemisphere was greatly enlarged by a cystic tumour which invaded the cerebellar tissue which projected from the surface of the cerebellum. The surface of this tumour consisted of grape-like processes. Histological examination of the cerebellum showed numerous cysts typical of those found in infestation with *Coenurus cerebralis*. Many of the cysts were sterile (this seems to be characteristic of the condition) ".

No history was available for the Bantu man, who died in coma in the hospital. " *Necropsy* showed a cystic mass, destroying the left occipital

lobe and projecting from the surface of the brain. The mass was about 1 in. in circumference. A similar, but smaller, cystic lesion was present in the right occipital lobe, and a third collection of small grape-like cysts was present in the right temporal lobe. The cysts contained a scolex and hooklets typical of *Multiceps multiceps*."

The authors believe that this infection may be commoner than is realized, especially in sheep-rearing localities where dogs are numerous. They comment on the difficulty of diagnosing the condition during life because "the clinical picture is one of increased intracranial tension only".

Operation is often successful: for example, recovery after operation occurred in all 4 cases reported by Becker and Jacobson [this *Bulletin*, 1952, v. 49, 161, 419]. *J. J. C. Buckley*

Kaneshima, S. & Sakae, F. **A Case of Liver Echinococcosis (Alveolar Type) disclosed by Needle Biopsy.** *Acta Med. et Biologica.* Niigata. 1955, July, v. 3, No. 2, 105–10, 2 figs. [12 refs.]

"This report is concerned with a case, which we could diagnose as liver echinococcosis of alveolar type by means of needle biopsy without any side reactions. The patient seems to be infected with the disease during his residence either in Kurile Island or in Siberia."

Antonio, D., Jr., Peñas, M. D. & Pantangco, E. **Renal Echinococcosis.** *J. Philippine Med. Ass.* 1955, Nov., v. 31, No. 11, 607–12, 5 figs. (3 coloured).

Sadun, E. H. **Studies on the Distribution and Epidemiology of Hookworm, *Ascaris*, and *Trichuris* in Thailand.** *Amer. J. Hyg.* 1955, Sept., v. 62, No. 2, 116–55, 18 figs. [Numerous refs.]

Nearly 31,000 persons from the 4 regions of Thailand (south, central, north and north-east) were examined by direct smear method for infection with hookworm, *Ascaris* and *Trichuris*. Most of the examinations (nearly 23,000) were in the north-east region where a concurrent survey of *Opisthorchis viverrini* was being carried out [see above, p. 620].

Hookworm. Of 22,788 people examined in the north-east region, 22·8 per cent. had hookworms, the infection rate in rural being higher (27·8 per cent.) than in urban populations (17·9 per cent.). In the central region the figures for hookworm were 26·9 per cent. of 4,088 examined, the rural and urban rates being 26·9 and 10·3 per cent., respectively. Areas subjected to flooding during parts of the year had a much lower infection rate (3·4 per cent.) than the drier regions. The highest infection rate in Thailand was in the south region where 43 per cent. of 2,715 examined were positive for hookworm. Analysis of this population

according to age-group showed an increase up to the age of 10–14 years and a decrease after the age of 30 years. In males the infection rate was significantly higher than in females from the age of 10 years onwards.

Ascaris. In the north-east region 10·1 per cent. of 22,788 people examined were positive; in the central region 20·2 per cent. of 4,088 examined; in the south, 70 per cent. of 2,715 examined.

Trichuris. In the north-east region 3·5 per cent. of 22,788 examined were positive; in the central region 5·4 per cent. of 4,088 examined; in the south, 53 per cent. of 2,715 examined.

The data acquired for *Ascaris* and *Trichuris* infections are on the whole similar. For both infections the incidence in rural and urban populations did not differ much, unlike that of hookworm; nor was there much difference between their incidence in areas inundated for part of the year and in areas permanently above water. The incidence and intensity was highest in children and higher in females than in males.

It is concluded that in South Thailand these 3 nematode infections are a major public health problem. Control measures suggested are latrine construction, educational propaganda especially for children, and mass treatment. *J. J. C. Buckley*

Dawood, M. M. ***Ascaris* in Alexandria.** *J. Egyptian Pub. Health Ass.* 1955, v. 30, No. 2, 69–73.

The results of an investigation into the causes of the high incidence of ascariasis in Alexandria and surrounding villages are reported. Among the poorer inhabitants facilities for defaecation are inadequate or lacking. Soil samples, weighing 5 to 10 gm., from a variety of sites were examined for *Ascaris* ova; few were found to be negative and counts ranging from 1 to 120 were noted in samples from the floor of latrines, from houses and from the street. It is concluded that the soil is extensively contaminated with *Ascaris* ova and that a simple latrine such as the bored-hole latrine should be provided in the houses of the poor. *T. H. Davey*

Fairbairn, D. **The Muscle and Integument Lipids in Female** *Ascaris lumbricoides*. *Canadian J. Biochem. & Physiol.* 1956, Jan., v. 34, No. 1, 39–45. [15 refs.]

Kempski, H. W. Nuevos conceptos de broncopatias y parasitosis sobre todo en relación al cuadro asmático en niños. [**New Concepts of Bronchial Disease and Parasitism with special reference to Asthma in Children**] *Semana Med.* 1956, Jan. 5, v. 108, No. 1, 1–5. [17 refs.] English summary.

During the course of a clinical and coprological examination of 5,169 persons in Bolivia in 1940–1941, 98·7 per cent. of whom were shown to

harbour helminths, the author was impressed by the frequency of asthma in children. Many of them had been suffering from asthma for some years and had received symptomatic treatment without success. A table shows that among the 5,169 persons examined in 8 areas, bronchial disease was present in 16·8 to 55·0 per cent. (average 35·9 per cent.). Asthma accounted for many cases and treatment for the helminthic infection made any symptomatic treatment for the asthma unnecessary. The common parasites were *Ascaris* and hookworms and it was noticed that spasms were more pronounced when there was a heavy infection with more than one species of helminth.

The asthmatic disposition is explained chiefly by the trauma caused to the lung tissue during larval migration and to this is added disturbance of calcium metabolism, resulting in a tendency to spasms.

Early recognition of the helminthic origin of these conditions makes it possible to prevent these distressing complaints in children. Even in temperate climates, the presence of *Ascaris* should be looked for in differential diagnosis of asthma in children, and repeated faecal examinations should be carried out. *H. J. O'D. Burke-Gaffney*

López Rico, A., Loyo Díaz, Celia, Retolaza Díaz, Teresa & Bravo Becherelle, M. A. Tratamiento de la ascaridiosis con citrato de piperazina y hexilresorcinol. Estudio de 157 casos. [**Treatment of Ascariasis with Piperazine Citrate and with Hexylresorcinol; Study of 157 Cases**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, Sept., v. 15, No. 3, 187–93.

The English summary appended to the paper is as follows:—

"The results obtained in the treatment of 157 cases of ascaridiasis are presented; 104 of them were treated with pyperazine citrate, and 53 with hexylresorcinol.

"The pyperazine citrate syrup, in all ages was effective in more than 90%. Children accepted it very easily because of its pleasant taste. No laxative was necessary. It produced vomit in two cases.

"Hexylresorcinol was effective in all groups of age, except that of prescholars, in which it was less effective, may be because of insufficient doses."

Hoekenga, M. T. **Treatment of Multiple Intestinal Worm Infections with Piperazine Citrate.** *Amer. J. Trop. Med. & Hyg.* 1955, Nov., v. 4, No. 6, 1088–90.

The ascaricidal property of piperazine is now well known. The author has carried out studies to determine the shortest course or smallest effective dose and also the cure rate in helminth infections other than ascariasis.

The studies concerned 95 labourers in La Lima, Honduras: 85 harboured *Ascaris*, 74 had *Necator* and 48 *Trichuris*.

Piperazine citrate was used either in syrup form or in gelatin capsules: 5 ml. of the syrup or one capsule contained the equivalent of 500 mgm. of piperazine hexahydrate. No fasting or purging was adopted and faecal examinations were made at 10 days and again at 2 to 4 weeks. The criterion of cure was absence of eggs at these examinations.

The schedules used included (a) 10 ml. (1 gm.) of the syrup twice daily for 6 days, (b) 20 ml. (2 gm.) of the syrup in a single daily dose for 6 to 10 days, or (c) 4 gelatin capsules (2 gm.) in a single dose for 3 to 6 days. The results are shown in tables. Whatever the schedule, piperazine achieved a cure rate of over 90 per cent. in *Ascaris* infections, sometimes even after as short a period as 3 days.

The effect was negligible in the case of hookworm infections, or of *Trichuris* infections when the drug was given for only 3 days: however, a course of 6 to 10 days cured about a quarter of the *Trichuris* infections. [All the results are shown as percentages, but the numbers in each treatment schedule were small and never exceeded 18]. No toxic effects were observed.

The author discusses his previous studies on the treatment of ascariasis in Honduras [this *Bulletin*, 1955, v. 52, 61] and points out the many advantages in the use of piperazine, *e.g.*, efficacy, low cost, palatability, equal value of syrup and capsules, and absence of need for fasting and purging: but there is still no good agent for a single-dose treatment, nor is there an "all-purpose" vermifuge. *H. J. O'D. Burke-Gaffney*

Bhaduri, N. V., Chowdhury, A. B. & Sanyal, P. K. **A Study on the Anthelmintic Action of the Cashew-Nut Shell Oil.** *Indian Med. Gaz.* 1954, Aug., v. 89, No. 8, 474–6.

A clinical trial of the anthelmintic properties of the oil of the shell of the cashew nut, *Anacardium occidentale*, was carried out on a number of hospital in-patients and out-patients in Calcutta with various helminthic infections. The patients were given milk only on the night before the administration and were given the oil in hard gelatin capsules or as an emulsion in milk, in the early morning. The oil usually had a purgative effect, but if the bowels were not open in 2 hours a saline purgative was given. The dosage of oil was 5 to 6 gm. for adults, 4 gm. for children from 10 to 14 years, and 2·5 to 3·5 gm. for children from 4 to 9 years.

Before treatment stools were examined by smear or Lane's DCF method and an egg-count by Stoll's method was usually made. A re-examination was made 10 days after treatment and an egg-count repeated if any eggs were found; a longer interval was allowed in the cases of certain worms.

There were no toxic effects from the oil. No cure was effected in *Enterobius* infection (10 cases), *Taenia saginata* (3 cases), *Trichuris* (10 cases), but cure was effected in 7 cases of *Hymenolepis nana* infection after the first treatment and in 4 more after the second out of a total of 13, in 1 of 2 cases of *Strongyloides* infection after the first dose, and in 1 case of *Fasciolopsis buski* infection after the second dose.

" The action is best against *Ascaris lumbricoides*. In doses of 5 to 6 Gm, 30 out of 47 cases were cured by a single treatment; and in 5 more cases the egg-count was reduced 70 per cent. or more showing that most of the worms were expelled. The cases were, therefore, almost cured. Some of the cases not cured by the first treatment were given a second treatment. In all 32 out of 47 were cured and 7 more almost cured.

" With a dose of 5 to 6 Gm of the oil used on hookworm cases, 28 out of 78 were cured and 6 more almost cured by a single treatment. Some were treated a second time, and after two treatments, out of a total of 78 cases 33 were cured and 11 almost cured."

[While the fact that this is a medicine of indigenous origin will be of some interest to the Indian investigators, there is little encouragement from the results obtained for anyone to desert the far more effective anthelmintics in general use today.

See also this *Bulletin*, 1953, v. 50, 1069.] *L. E. Napier*

Woodman, H. **African Filariasis.** *Central African J. of Med.* 1955, Nov., v. 1, No. 6, 289–94, 4 figs. [27 refs.]

Jordan, P., Trant, M. H. & Laurie, W. **Non-Bancroftian Elephantiasis in Tanganyika.** *Brit. Med. J.* 1956, Jan. 28, 209–10.

In a filarial survey of Tanganyika which has just been completed, night-blood samples were taken from several thousand Africans and, speaking generally, more cases of elephantiasis were seen in those areas where bancroftian microfilaraemia was common than in those areas in which it was rare.

In one area lying south-west of Lake Victoria between 4,000 and 6,000 feet above sea level, night-blood samples were obtained from 475 adults in 4 villages. All were found negative for microfilariae of *W. bancrofti*, though 12 persons had elephantiasis of the leg. From other villages that were free from *W. bancrofti* infection, or in which the incidence was less than 5 per cent., 6,866 night blood specimens were obtained and only 8 cases of elephantiasis seen. The higher incidence of elephantiasis in the first villages suggests that the disease in this part of Tanganyika is caused by something other than *W. bancrofti*. Subsequently a total of 62 cases of elephantiasis were seen in this area.

The age incidence was analysed in the areas under study and, as shown

in a table, the disease occurs at an earlier age in the non-bancroftian series. Histories obtained suggest that the non-bancroftian elephantiasis usually starts with pains in the groins, but it does not seem to have the centrifugal distribution sometimes seen in cases of filarial elephantiasis.

Dipetalonema perstans is very common in the area in which these cases were seen (143 out of 475 blood specimens had microfilariae of *D. perstans*).

Other reports of non-bancroftian elephantiasis from E. Africa describe a similar condition [Loewenthal, this *Bulletin*, 1935, v. 32, 182; Clark, *ibid.*, 1949, v. 46, 283].

The velvety appearance of the skin was present in both filarial and non-filarial cases of elephantiasis.

[This is not the first occasion on which an attempt has been made to implicate *Dipetalonema perstans* with a pathogenic rôle. This worm has a wide distribution in the tropics of both old and new worlds where elephantiasis is not known. The abstracter has seen several instances in Europeans from West Africa with allergic manifestations resembling those of Calabar swellings, and in which embryos of *D. perstans* were found, but where it was obviously impossible to exclude a superadded infection with *Loa loa*.

There is a similar difficulty in demonstrating satisfactorily the past or present existence of *W. bancrofti* in all cases of elephantiasis, even in hyperendemic areas, and that renders the true answer to this question difficult to give.] *Philip Manson-Bahr*

Galliard, H. & Brygoo, E. R. *Microfilaria bancrofti* var. *vauceli*, variété nouvelle de la Côte Sud-Est de Madagascar. [" *Microfilaria* " *bancrofti* **var.** *vauceli*, **a New Variety from the South-East Coast of Madagascar**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 4, 473–5.

In examining microfilariae in human blood derived from the south-east coast of Madagascar (Manakara, Fort Carnot, Lahorano, Ifaho) the authors discovered, in a thick drop, some microfilariae with a superficial resemblance to those of *Wuchereria malayi*. On the whole they are small with an irregular aspect, twisted, with the principal curves distorted by secondary undulations in contrast to the regular " gracious " curves of *W. bancrofti*. In size they resemble microfilariae of *W. malayi* (180–275 μ as against 165–265 μ for *W. malayi* and more than 300 μ for *W. bancrofti*). The somatic nuclei, which are regular and discrete in *bancrofti*, are more or less conglomerated and difficult to count as in *malayi*. The cephalic space is as long as it is broad as in *bancrofti*.

Nevertheless, the microfilariae differ in certain characters from those of *malayi*, especially in the absence of a bulbous swelling and of a terminal nucleus in the tip of the tail.

Another characteristic that separates them from *malayi* is the excretory cell, which is adjacent to the excretory pore, as in *bancrofti*, but which is farther away from it in *malayi*; but the genital cells are disposed more like those in *malayi* and they are of equal size and shape. The excretory pore is voluminous and easily identified, interrupting the nuclear column as in *malayi*, whereas in *bancrofti* it is small and difficult to see. The anal pore forms a neat cleft as in *malayi*.

Another feature which may be specific concerns the *innenkörper*, which instead of being compact and voluminous as in *bancrofti*, or divided into segments as in *malayi*, is here composed of small granules which are coloured bright red with Giemsa. The differences are set forth more exactly and minutely in a table.

It must be added that the characters described have been observed so far only in thick-drop specimens. In thin smears it is well known that variations in one or more specimens are considerable (especially in size). The presence of the sheath and the contraction of the contained embryo often renders detailed study impossible. Making allowance, therefore, for individual differences in size of microfilariae of *L. loa*, *W. bancrofti* and *malayi*, and of the variety under review in thick drops there remains the fact that all varieties retain their characteristic attitude. No method of fixation or staining, good or bad, tends to modify this characteristic attitude of microfilariae.

[The recognition of the new variety of microfilaria would be much assisted by a figure showing the salient points. Doubtless one will shortly be forthcoming.] *Philip Manson-Bahr*

Wu, Yao-tsing & Huang, Yun-se. **Filariasis among Ta-Chen Evacuees.** *J. Formosan Med. Ass.* 1955, Aug., v. 54, No. 8, 247–53.

The Ta-Chen islands are situated along the S. China coast in the Chekiang Province and lie between about 31° and 32° N. latitude and between 121° and 122° E. longitude. They include 12 townships and a total population of 19,065. The inhabitants are engaged in fishing or agriculture.

When the Ta-Chen evacuation was carried out in February 1955 about 18,000 civilians came to Formosa. To ensure that no malaria from outside Formosa would endanger the already organized programme all evacuees were examined for malaria. This survey having proved negative a filariasis survey was conducted and out of 239 slides 30 or 12·55 per cent. showed microfilariae of *Wuchereria malayi*. On this information a filarial survey was organized. During this survey night-blood smears of 8,848 people were examined; 831 (9·39 per cent.) were positive for microfilariae. No remarkable difference in the microfilaria rates for males and females was demonstrated. Of the 831 microfilaria carriers 788 were positive for *W. malayi* and 38 for *W. bancrofti*, with 5 mixed infections.

The filarial infection rate showed a progressive rise in the successive age-groups.

Fourteen cases of elephantiasis of the legs were found among 162 persons clinically examined, giving a gross filaria disease rate of 8·64 per cent. Generally speaking the more advanced age-groups showed the higher incidence of filarial disease. The microfilariae of *W. malayi* exhibited marked nocturnal periodicity with a high incidence in the peripheral blood at night between 21.00 and 03.00 hours.

As regards Taiwan (Formosa) proper, in a previous study by other workers only 8,957 were surveyed in 22 villages in the south-west. The infected focus was limited to 6 villages with a population of 3,786, of whom 134 (3·54 per cent.) were infected. The rate of infection in 13,975 mainlanders in 3 areas in that study was 3·27 per cent. in Peng-Hu, 5·79 per cent. in Kinmen and 3·93 in Taiwan.

Therefore a very low endemicity of filariasis due to *W. bancrofti* was revealed in south-west Formosa, and it is suggested that steps should be taken to prevent any spread from the carriers who arrived from the Ta-Chen islands. *Philip Manson-Bahr*

Neves, H. de A. & Scaff, L. M. Comprovação da microfilaremia congênita de *Wuchereria bancrofti*. [**Confirmation of Congenital Microfilaraemia in** *Wuchereria bancrofti* **Infection**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, Apr., v. 6, No. 2, 283–4. English summary.

The authors had previously reported the finding of microfilariae of *W. bancrofti* in 2 infants in Belém, Brazil, aged 3 and 10 days [this *Bulletin*, 1953, v. 50, 1158]. To test the probability of congenital infection, suggested by the very early appearance of the microfilaraemia, they examined 436 specimens of placental and cord blood and found microfilariae of *W. bancrofti* in 14 (3·2 per cent.) and 3 (0·7 per cent.) specimens respectively. In each case, 20 cmm. of blood were examined [shown in English summary as "20 cc."], and the density of microfilariae was between 1 and 39 in the placental blood and 1 to 36 in the cord blood.

In two cases, the microfilariae were found in both sites. All the mothers concerned in positive findings had been delivered at night, that is, when the density of microfilariae is highest. It is the authors' belief that these findings are evidence of congenital microfilaraemia occurring in *W. bancrofti* infection. *H. J. O'D. Burke-Gaffney*

Rachou, R. G., Deane, L. M., Damasceno, R. G. & Lima, M. M. Relação entre a microfilaremia horária da *Wuchereria bancrofti* e a freqüência domiciliária horária do *Culex fatigans* no norte e no sul do Brasil. [**Relationship in Time between Microfilarial Periodicity**

of *Wuchereria bancrofti* and Activity of *Culex fatigans* in Houses, in Northern and Southern Brazil] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Apr., v. 6, No. 2, 205–18, 6 graphs. English summary (6 lines).

The English summary appended to the paper is as follows:—

"Based on observations made in two cities, Belém and Florianópolis respectively in Northern and Southern Brazil, the authors were able to confirm the existence of a correlation between the periodicity of microfilariae of *Wuchereria bancrofti* and the hematophagic activity of *Culex fatigans* inside houses. In both cities, the microfilariae have a definite nocturnal periodicity, the peak of which is at 1 a.m. in Belém and at 4 a.m. in Florianópolis."

McCarthy, D. D. & Fitzgerald, N. **I. Habit, Habitat and Hyperfilariation in the Epidemiology of Filariasis in Western Samoa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Jan., v. 50, No. 1, 58–65, 4 figs.

The present paper is a sequel to a previous communication [see this *Bulletin*, 1955, v. 52, 469] and gives a general description of the activities of the various age-groups of Samoans and discusses their possible relationship to the epidemiology of filariasis.

Up to the age of 5 or 6 there is little difference between the activities of the sexes. They are never far from their houses. During the next 5 years they are occupied in baby-tending, though the boys wander round the village, coming into closer contact with the bush and its mosquitoes. Up to the age of 15 the girls are still domesticated, while the boys assist in fishing and the work of the plantations. After marriage the young women spend some time in the plantations, but after the age of 40 they once more retire into the village community.

The degree of contact between host and vector is affected, not only by environment, but also by the amount of body surface which is exposed to mosquito bites, and the male Samoan is thus more vulnerable to mosquito attack.

In addition to the habits and environment of Western Samoan villagers, information was collected to throw light on the apparent change in endemicity which had occurred over the past 30 years between Buxton's survey of 1925–26 [*ibid.*, 1927, v. 24, 941] and the present one of 1953–54. A difference in the blood incidence of microfilariae and the average microfilarial densities for different age-groups in inland and coastal villages suggested that the latter are not really heavy foci of infections, but that bush tracks and plantations are the sites where most transmissions of filariasis occurs. Bathing and washing localities are also danger points for women and children. The lower rate of incidence among the latter, of both sexes and of school age in coastal villages,

compared with those of the same age inland indicates a difference in intensity of infection within the villages themselves. Microfilarial counts averaged in age-groups can indicate changes in intensity of transmission and endemicity. It is suggested that in this form microfilarial blood counts have a value as an index of endemicity and, when repeated at intervals in the same area, point to changes in endemicity more clearly than the figures for blood incidence or the appearance of obvious physical signs.

The highest average figure for any age-group was 81–82 and was common to all 3 series of figures for males (coastal and inland villages 1953–54; Buxton's survey 1925–26). This suggests probably that the saturation point of parasite load within the host has been reached. The peak average density bears no relationship to the onset of the major clinical signs of filariasis, such as hydrocele and elephantiasis, for the latter occurs in women, in whom the highest average microfilarial density was only 65.

"The average age-group densities, considered in relation to the incidence of major physical signs of filarial disease, suggest that the development of these major signs requires a certain minimum parasite load to be maintained for some few years. In Western Samoa it is suggested that the minimum parasite load is that equivalent to an average age-group count of 60 microfilariae per 20 c.mm. blood, and that if this be maintained hydrocele will appear in the male population approximately 5 years later, and that elephantiasis will first appear approximately 10 years later." *Philip Manson-Bahr*

McCarthy, D. D. **II. Pseudo-Periodicity in the Pacific Variety of *Wuchereria bancrofti*: a Study of Fluctuations in the Density of Microfilariae in the Peripheral Blood of Samoans.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Jan., v. 50, No. 1, 66–71, 2 figs.

Edgar *et al.* [this *Bulletin*, 1953, v. 50, 539] have recorded a periodic tendency in microfilariae in Tahiti. During investigations in Western Samoa in 1953 an impression was gained that microfilarial densities in the peripheral blood were greater in afternoon samples than in those taken in the morning. This subject was further explored in 1954. The present study was made on a group of prisoners in a Central Prison farm near Apia where they were subject to uniform regimen of rest, exercise and feeding habits.

All blood samples were taken on the same day and at 3-hour intervals, commencing at 6 a.m. and ending at 9 p.m. At 3 p.m. three separate samples were taken from each subject from the same puncture. The smear of 20 cmm. of blood was dehaemoglobinized in 0·5 per cent. acetic acid, dried, fixed and stained with Giemsa. During the examinations it was noted that many of the microfilariae, particularly in the afternoon

samples, were not completely extended, but had a portion of the tail actually flexed forward along the body within the sheath. The length of the reflexed portion might extend one-third of the total length. By making differential counts of the proportions of these to the fully extended forms, some tentative conclusions were arrived at. In the individual counts the highest occurred at 3 p.m. (in 12) and at 6 p.m. (in 8). In the remaining 3 cases the peak occurred at noon in two and at 6 a.m. in the third.

The average count for each time period showed a marked increase between 9 a.m. and 12 noon and continued at the same rate until 3 p.m. Between 3 p.m. and 6 p.m. the number began to fall, after which the rate of decrease again increased rapidly till 9 p.m. The distribution of peak densities between 3 p.m. and 6 p.m. suggested that the true peak occurred between these two periods of time. Statistically these figures are highly significant.

The differential counts of extended and reflexed microfilariae showed that the number of the latter increased from 9.0 a.m. to 3 p.m. when it reached its peak, after which the count decreased slightly during the later afternoon and evening though at 9 p.m. it was still much higher than in the early morning. The extended forms reached their greatest density about noon, after which their number decreased slightly to the morning level which was maintained until evening, but by 9 p.m. the count had fallen to below the early morning figures.

The results of 3-hour counts showed a curve of varying densities strongly suggestive of periodicity and the coincidence of the plateau of this curve with the peak biting period of *Aëdes polynesiensis* suggests an alliance between parasite and vector. It is suggested that the reflexed forms are young microfilariae as described by O'Connor [this *Bulletin*, 1923, v. 20, 891]. An increase in both young and old forms is possibly produced by morning exercise which increases the blood flow through the peripheral capillaries.

The general increase which occurs between 9 a.m. and noon is due to increase in both "young" and "old" forms. In both cases the rise is considered to be due to physiological effects rather than to periodic tendencies. The marked increase of the young forms may be related to the emptying of the lymphatic system into the blood stream. It appears that, after parturition by the female worm, the embryo microfilariae are not fully extended in their sheaths and they must traverse lymphatics for a considerable distance before reaching the blood stream and their abilities to propel themselves are small until their tails are fully extended. The fact that the larvae remain reflexed until reaching the blood stream may possibly be explained by the low available oxygen content of the lymph, compared with that of the blood. Lymph flow is increased by exercise and taking of meals and the small rise between 6 p.m. and 9 p.m. may well be the result of the stimulus provided by exercise and the evening repast.

[For those who have studied filariasis for many years the subject-matter of this paper and the conclusions based upon it are not convincing. Some of the inferences on the supposed migrations of microfilariae in the body appear to be very theoretical. It has already been abundantly proved by Gönnert [*ibid.*, 1943, v. 40, 160] and others that the lifespan of individual microfilariae is one of months or years. It is difficult to account for this hypothetical and massive immigration of juvenile forms during the day-time.

The posture of the tail of the microfilariae in their sheaths may bear some other interpretation. The first point is that no reference is made to this posture in the *living* state. As the abstracter had a somewhat similar experience in his original work in Fiji in 1910, he would suggest that this reflexion is an agonal phenomenon assumed during the drying of the film. Furthermore it must be realized that the sheath is extremely elastic—a property which can readily be demonstrated when the anterior end becomes stuck to the coverslip, when it elongates into a narrow slip, only to rebound, like the finger of a rubber glove, when released.] *Philip Manson-Bahr*

Galliard, H. L'éosinophilie dans les filarioses. [**Eosinophilia in Filariasis**] *Rev. Path. Gén. et Comparée.* 1955, Nov., v. 55, No. 672, 1296–1315. [48 refs.]

Among nematodes the filariae are certainly the most active in the genesis of eosinophilia in the course of their metabolism, and it is thought that glucido-lipido-polypeptides are responsible for the formation of eosinophilic granules in the tissues. Some investigators have postulated that there was correlation between the number of microfilariae in the blood and the eosinophilic response at any given time, but this is probably not so.

All are agreed that the human filariae evoke considerable eosinophilia. Those who have studied *W. malayi* have not found an eosinophilia which differs from that of *W. bancrofti*. In Tonking, the eosinophil index varied from 6 to 23 per cent. in *W. malayi* infections. An increase of eosinophilia in the blood in microfilaraemia is chiefly evident in Europeans, less so in Africans and in Asians.

On the whole, as recorded by Galliard in Gabon, in infections with *D. perstans* and *L. loa* the infection rate as well as the eosinophilia tend to increase progressively with age. On the other hand the degree of eosinophilia is not necessarily proportional to the degree of infection. Furthermore, the intensity of the eosinophilia tends to be more directly concerned with clinical episodes than with the microfilaraemia, but this is not absolute. In the case of *L. loa* there does seem to be some correlation between the eosinophilia and the degree of infection with the parasite.

The low eosinophilia, or its absence, in elephantiasis, even in the Pacific, can be satisfactorily explained by the absence of filarial activity in this state of hyperfilaration.

The infiltration of eosinophils in the tissues is especially marked in *W. malayi* infections where it is most important in the peripheral lymphoid sinuses. There have been reports that this tissue-eosinophilia disappears after proper treatment with diethylcarbamazine.

The effects of corticotrophin are seen in the irreducibility of filarial eosinophilia under the action of this hormone (25 mgm. of corticotrophin by the intramuscular route and counting of the eosinophils after a 4-hour interval). This is known as the Thorn test. Here again racial differences are important, though inexplicable. This is especially the case with cortisone which invariably provokes an eosinopenia in white persons, but in Africans with filariasis produces either no such response or a slight eosinopenia in this infection, although irreducibility is often very strikingly produced in normal Africans.

[This is a very full review and discussion of results obtained by the author and other workers, with which readers of this *Bulletin* will be familiar. Details should be sought in the original.]

Philip Manson-Bahr

Crosnier, R. Filarioses et Notézine. [**Filariasis and Diethylcarbamazine**] *Rev. Path. Gén. et Comparée.* 1955, Nov., v. 55, No. 672, 1336–62. [Refs. in footnotes.]

Notézine (diethylcarbamazine) is by no means an ideal or perfect remedy, but has so far proved to have no rival in the treatment of filariasis.

It can be exhibited in infections due to all pathogenic filariae on which it has action, but it is indicated particularly in onchocerciasis, especially when accompanied by ocular complications. It is the best prophylactic against filarial blindness in Central Africa, but it is inoperative in established amaurosis; hence its use should not be delayed. The campaign against onchocerciasis has proved to be as important as that against trypanosomiasis. The action on microfilariae is rapid, but it is much slower on the adult forms, especially of *W. bancrofti*. In onchocerciasis it is not advisable to exceed the dosage of 2–3 mgm. per kgm. at least in the early stages of treatment, with the idea of limiting the phenomena of reactivation.

Theoretical comparisons are made between some of the effects of diethylcarbamazine in filariasis and that of chloramphenicol on the *Salmonella* group. Finally, it is suggested that trials should be considered with corticotrophin or cortisone as an adjuvant to diethylcarbamazine on the basis of their possible lytic action on the microfilarial lymphatic glands.

[This is a very full account of diethylcarbamazine in filariasis, with

references to the literature with which readers of this *Bulletin* will be familiar. The paper should be read in the original.]

Philip Manson-Bahr

McGregor, I. A. & Gilles, H. M. **Diethylcarbamazine Control of Bancroftian Filariasis. Follow-up of a Field Trial in West Africa.** *Brit. Med. J.* 1956, Feb. 11, 331–2.

In 1951 [see this *Bulletin*, 1953, v. 50, 232] a field trial of diethylcarbamazine was carried out in Keneba, a Gambian village in the West Kiang District.

In the present paper the results obtained 3 years and 9 months later are contrasted and summarized with those 10 months after treatment. Each person who had completed the prescribed course had received 25 mgm. diethylcarbamazine per kgm. of body weight; 122 persons infected with *W. bancrofti* and treated in this manner in February 1951 were subsequently examined in December 1951 and again in November 1954. The percentage cured was found to have risen from 64·7 per cent. in December 1951 to 73·8 per cent. in November 1954; of 32 still infected in November 1954, 46·8 per cent. appeared to have maintained their original infection while 53·2 per cent. seem to have "relapsed" after a period of apparent cure.

A hypothesis is put forward that diethylcarbamazine exerts a sterilizing effect on the reproductive organs of the adult parent filaria worm.

Philip Manson-Bahr

Neves, H. A., Rachou, R. G. & Scaff, L. M. Primeiros resultados de observações relativas à ação do Hetrazan sôbre a microfilaremia de *Wuchereria bancrofti* feitas em Belém, Pará. [**Preliminary Results of Observations on the Action of Diethylcarbamazine on Microfilaraemia due to *W. bancrofti* in Belém, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1955, Jan., v. 7, No. 1, 41–9, 3 graphs.

The English summary appended to the paper is as follows:—

"Hetrazan has been given to carriers of microfilariae of *Wuchereria bancrofti* in the daily doses of 6 mg per kg of body weight, t.i.d., during 7, 10, 15 and 21 days. The treated carriers are being followed up to 18 months after the treatment. The observations of the groups treated during 7 and 10 days are finished and the two other schedules are running up.

"In both schedules, of 7 and 10 days of treatment, a great reduction of the microfilariae density has been observed and maintained during a long period of time. 18 months after the treatment, the microfilariae density (average number of microfilariae per positive sample of blood) was about 15% of the pre-treatment density, and only 20% of the observed carriers revealed microfilariae in the blood."

Rachou, R. G., Neves, H. A. & Scaff, L. M. Da possibilidade do emprêgo de Hetrazan em esquemas de curta duração no combate à bancroftose. [**Possibility of using Short Courses of Diethylcarbamazine in the Control of** *Wuchereria bancrofti* **Infections**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1955, Jan., v. 7, No. 1, 37–9, 1 graph.

The English summary appended to the paper is as follows:—

"The authors observed the reduction of microfilariae density among 43 carriers of mf. of *Wuchereria bancrofti*, treated with Hetrazan during 7 days at the daily doses of 6 mg per kg of body weight. A reduction of 82·8% in the number of mf. was observed after the first day of treatment, when only 53·4% of the carriers revealed mf. in the blood. After the third day of treatment these percentages were, respectively, 93·1 and 34·9. Based on these data the authors began some observation with a '3 day schedule' of treatment using the daily doses above referred and with a '1 day schedule' of treatment at the doses of 10 and 12 mg per kg of body weight."

Bangham, D. R. **The Mode of Action of Diethylcarbamazine investigated with ^{14}C-Labelled Drug.** *Brit. J. Pharmacol. & Chemotherapy*. 1955, Dec., v. 10, No. 4, 406–12, 4 figs. [15 refs.]

A previous investigation by the author showed that Hetrazan (diethylcarbamazine) is rapidly metabolized and excreted in the urine after intravenous or oral administration. The present investigation describes the uptake of drugs by various organs of the host, by microfilariae and adult worms, as well as the initial effect of the drug on microfilariae of both *Litomosoides carinii* and *Dirofilaria immitis* after intravenous injection. Heavily infected cotton rats were used to provide the former and the microfilariae were counted on Giemsa-stained thin films. In order to demonstrate their disappearance from the blood a special polythene valve-cannula was used to withdraw samples of blood from an artery every 6 to 10 seconds or at longer intervals by an electro-mechanical device after injection of the labelled drug. Radioactivity assays and chromatograms of a chloroform extract were then made on the blood samples. Uptakes of the labelled drug by microfilariae were also estimated after 1 hour's incubation *in vitro* at 37°C. for both species. No preferential uptake of the drug was observed in any organs or tissues of the treated host. Likewise in *in vitro* experiments there was no preferential uptake by blood cells, by *Litomosoides carinii* or by microfilariae of *Dirofilaria immitis*. Under *in vitro* conditions metabolites of diethylcarbamazine do not appear to affect microfilariae of *Litomosoides carinii*. The author concludes that microfilariae are modified in some way by the drug so that they are removed like foreign particles. *J. D. Fulton*

Rodhain, J. Au sujet de la localisation de *Dipetalonema vanhoofi* E. Peel et M. Chardome chez le chimpanzé [**Localization of *Dipetalonema vanhoofi* in the Chimpanzee**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 5, 672–7, 2 figs. on 2 pls.

Norman, Lois & Donaldson, A. W. **Spores of Helicosporous Fungi resembling Microfilariae in Blood Films.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 889–91, 6 figs. on pl.

"Structures which superficially resembled microfilariae were found on blood films and in other types of clinical material. These organisms, however, apparently are airborne spores of helicosporous fungi and represent contaminants on the blood films. It is believed that these objects have been mistakenly identified by other workers as microfilariae or as other species of worms."

Burch, T. A., Qualls, D. M. & Greenville, H. J. **Onchocerciasis in Liberia.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 923–9.

The authors made a detailed examination for onchocerciasis of 2,423 male labourers on a plantation in Liberia. Nodules of onchocerciasis were found in 469 (19·4 per cent.). Approximately 90 per cent. of 593 nodules were found in the pelvic region; of these 29·4 per cent. were found near the coccyx, best detected by grasping the coccyx between the thumb and index finger. Only 11 (1·9 per cent.) nodules occurred on the head. Nodules were diagnosed clinically but the error in diagnosis was estimated by aspirating the contents of 66 nodules and examining the fluid for *Onchocerca volvulus* and, if negative, excising the nodule. Only 2 were negative. This indicates an error of only 3 per cent. in clinical diagnosis.

Nodules of onchocerciasis may occur with negative skin biopsies and scarification smears. This was found in 13 out of 174 men examined. It is more frequent to find microfilariae by skin biopsy or scarification smear in the absence of nodules (58 out of 174). Microfilariae are demonstrated more frequently by skin biopsy than by scarification smears (243 or 34·9 per cent. of 696 compared with 146 or 23·6 per cent.). With both methods the percentage of positives reached 39·9 per cent. However, *W. bancrofti* and *D. perstans* may be found in skin biopsies and differentiation of the microfilariae necessitates staining.

Ocular complications appeared to be infrequent but small nebulae and other minute corneal opacities occurred with greater frequency among those with onchocerciases than among the uninfected.

[This is a model study.] *Frederick J. Wright*

Gibson, C. L. **The Indiscriminate Feeding of Anthropophilic *Simulium* upon Man and Domestic Animals, and its relation to Studies on the Transmission of Human Onchocerciasis in Guatemala.** *Bol. Oficina Sanitaria Panamericana.* 1955, Mar., v. 38, No. 3, 293–5.

Simulium ochraceum, *S. metallicum* and *S. callidum* are the most frequent species implicated in the transmission of *Onchocerca volvulus* in Guatemala, and of these *S. ochraceum* is the most anthropophilic. All 3 species may feed on cows, horses and other vertebrates. It is possible that flies fed on different hosts might ingest microfilariae of more than one species of *Onchocerca*. Wild *Simulium* were allowed partly to engorge on human volunteers or domestic animals. They were then, after 1–2 hours, given the opportunity to bite a different species. *S. ochraceum* showed reluctance to resume feeding when man alternated with cattle and dogs, but not when man alternated with horse. *S. metallicum* and *S. callidum* completed interrupted meals with man alternating with cattle and horse. *S. metallicum* completed its meal on man after first feeding on dog but the reverse was not tested. *S. callidum* was not tested on the man and dog host combination. *B. R. Laurence*

See also p. 680, Lipparoni, Presenza del *Simulium damnosum* nella zona del medio Uebi Scebeli [**Presence of *Simulium damnosum* in an Area of the Middle Uebi Scebeli Region, Somaliland**]

See also p. 681, Enigk, Zur Biologia und Bekämpfung der Kriebelmücken [**Biology and Control of *Simulium***]

Pétard, P. Protidémie et lipémie chez 26 Noirs africains atteints d'onchocercose. [**Blood Protein and Fat in 26 Africans with Onchocerciasis**] *Méd. Trop.* Marseilles. 1955, July–Aug., v. 15, No. 4, 462–7, 1 fig.

In 26 Africans with onchocerciasis the total protein, albumins, globulins, total lipids, and cholesterol of the serum were determined. The proteins were differentiated by micro-electrophoresis on paper.

Compared with the values for normal subjects, lipids and cholesterol were unchanged, the protein figure was higher owing to an increase in globulins, sometimes accompanied by a decrease in albumins. The main increase in the globulins was in the gamma fraction. The alpha globulin was low.

Examination of 8 subjects after treatment with Moranyl-Notézine [antrypol and diethylcarbamazine] showed marked improvement of the A/G ratio in 4 patients, in 3 patients no improvement, although the symptoms had disappeared. It is suggested that the parasite produces the symptoms of disease only in those subjects already presenting anomalies in serum proteins due to faulty nutrition.

J. H. Birkinshaw

Havel, A. Terénní hodnocení oxyuriase systémem zamořenosti. [**Field Evaluation of Enterobiasis by the Infection Density Method**] *Časopis Lékařů Českých.* Prague. 1955, Nov. 11, v. 94, No. 46, 1239–41.

The author describes a method for calculating an index of the intensity of infection with *Enterobius* in a given environment. The *individual index* is first obtained from the mean number of eggs found by Schüffner's method in several observations upon the same subject; the index ranges from 1 (1–2 eggs) to 15 (35 eggs or more). The *total index* is then obtained by summing the individual values for all subjects in the given environments; this is then multiplied by 100 and divided by the total number of subjects to give the *infection density index*. An index of up to 99 per cent. represents a slight degree, and over 300 per cent. a heavy degree of infection. *D. J. Bauer*

Carrillo, R. A. Parasitosis por *Enterobius vermicularis* en 500 niños de La Paz, Baja California, México. [*Enterobius* **Infection in 500 Children in La Paz, Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, Sept., v. 15, No. 3, 183–5.

The English summary appended to the paper is as follows:—

"500 school children were examined by Graham's method to investigate *Enterobius vermicularis* infection. A total percentage of 22·4 positives was found."

Croce, E. J., MacGillivray, W. F. & Murphy, C. J. **Salpingitis due to** *Enterobius vermicularis*. **Report of a Case.** *New England J. of Med.* 1956, Jan. 12, v. 254, No. 2, 67–9, 1 fig.

"The parenteral infestation of *Enterobius vermicularis* is briefly reviewed.

"The rare 'urogenital migration' of the gravid worm through the female genital tract to oviposit within the peritoneal cavity seems to be the most plausible explanation for the lesions described in the literature.

"A case that was unusual in that the symptoms and signs developed under hospital observation is reported. The symptoms and signs seemed to be directly related to local host reaction to invasion of the parasite, and the microscopical appearance was consistent with the clinical stage of the lesion."

[See this *Bulletin*, 1951, v. 48, 748.]

Giuliani, V. Osservazioni sulla presenza di Elminti in appendici asportate chirurgicamente. [**Presence of Helminths in Appendices Removed Surgically**] *Nuovi Ann. d'Igiene e Microbiol.* 1955, Nov.–Dec., v. 6, No. 6, 454–6.

The English summary appended to the paper is as follows:—

"The result of parasitological researches upon 150 appendices surgically extirpated in the 'Ospedale Civile' of Aquila are reported.

"The frequence of helminths (11·33% of oxyuriasis and 2% of trichocephaliasis infestation) has been remarkably greater in the chronic (17 cases) than in the acute and subacute (2 cases) forms of appendicitis."

Combes, B., Damon, A. & Gottfried, E. **Piperazine (Antepar) Neurotoxicity. Report of a Case probably due to Renal Insufficiency.** *New England J. of Med.* 1956, Feb. 2, v. 254, No. 5, 223–4.

"An unusual case of piperazine toxicity, manifested by giddiness, torpor, a sense of detachment, inco-ordination and choreiform tremors, is presented. The patient was an adult being treated for pinworms. Failure to excrete the drug in the urine because of renal insufficiency was the probable cause of the toxic reaction. As with other drugs excreted by the kidney, caution should be observed in the administration of piperazine to patients with impaired renal function."

Kimsey, Letitia S. & Adams, S. L. *Trichinella spiralis* **in the Diaphragms of Humans and Swine.** *Pub. Health Rep.* Wash. 1955, Oct., v. 70, No. 10, 1001–9. [16 refs.]

"The direct microscopic examination of 311 human diaphragms from routine autopsies at the Louisville General Hospital, Louisville, Ky., revealed an 11·2 percent incidence of *Trichinella spiralis*. A second series of examinations, using both the direct microscopic method and a modification of the digestion-Baermann methods, detected an incidence of 20·8 percent in the 259 human diaphragms studied. No selection of material was made, except that the diaphragms of all children under 1 year of age were excluded.

"No conclusion could be drawn statistically as to the difference in incidence of infestation with *T. spiralis* by race, sex, or age because of the limited number of patients in each category.

"The incidence of human infestation with trichinae in Louisville is somewhat higher than that reported by other investigators in studies of human diaphragms taken at autopsy in various other cities in the southern part of the United States. However, there is no statistically significant difference between the incidence of *T. spiralis* reported in this study and that found by Wright in either the human population of the United States as a whole or in that section designated by him as the East South Central group of States to which Kentucky belongs [*Bulletin of Hygiene*, 1944, v. 19, 201].

"In the examination of 1,000 diaphragms collected from swine slaughtered in Louisville abattoirs, 2 were found infested with trichinae

by a modification of the digestion-Baermann method and one of these was also found infested by the direct microscopic method, an incidence of 0·2 percent. Although the exact type of feed is unknown, these swine may be classified as grain fed in conformity with the method used by Hall and others of classifying swine according to the type of feeding most prevalent in the section of the country in which the swine were raised. The incidence reported here is lower than the estimated average of 1·5 percent for the United States, but many other investigators have reported similarly low degrees of infestation.''

Sadun, E. H. & Norman, L. **The Use of an Acid Soluble Protein Fraction in the Flocculation Test for the Diagnosis of Trichinosis.** *J. Parasitology.* 1955, Oct., v. 41, No. 5, 476–82.

'' An acid soluble protein fraction antigen and a whole larval antigen were used in the flocculation test for the diagnosis of trichinosis in human, hog, and rabbit serums. The results obtained with the two antigens were very similar. The acid soluble fraction, however, could be stored indefinitely, seemed to confer upon the flocculation test a somewhat greater sensitivity, and produced a test easier to read and to interpret. No consistent differences in the reactions were obtained from serums of man and of the lower animals.''

Campbell, C. H. **The Antigenic Role of the Excretions and Secretions of *Trichinella spiralis* in the Production of Immunity in Mice.** *J. Parasitology.* 1955, Oct., v. 41, No. 5, 483–91. [25 refs.]

'' The excretions and secretions of *Trichinella spiralis* were collected by incubating the infective larvae in a nutrient fluid for five days after which the worms were discarded. Injections of the excretions and secretions stimulated the production of an immune response as evidenced by a more rapid loss of adult worms, stunting of adult female worms, and smaller numbers of larvae recovered from injected mice as compared with control mice.''

Coker, C. M. **Effects of Cortisone on *Trichinella spiralis* Infections in Non-Immunized Mice.** *J. Parasitology.* 1955, Oct., v. 41, No. 5, 498–504. [24 refs.]

'' Two different schedules of cortisone treatment of non-immunized mice receiving an infection with *Trichinella spiralis* resulted in longer persistence of more adult worms in the intestine, and establishment of more larval worms in the masculature, than in control mice.

'' Results of this experiment lend strong support to the view that non-immunized, mature mice develop a delayed measurable acquired

immunity against an initial infection with *Trichinella spiralis*. They show that treatment of such mice with cortisone, beginning shortly prior to infection and extending through the period when this acquired immunity normally would manifest itself, prevented or greatly weakened the expression of the immunity."

MAGATH, T. B. & THOMPSON, J. H., Jr. **The Effect of Irradiation of *Trichinella spiralis* on Immunity and its Public Health Implication.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 941–6. [11 refs.]

"These experiments demonstrate that feeding rats 500 larvae of *Trichinella spiralis* which have been irradiated with 30,000 r does not confer a demonstrable immunity against a challenging dose of 5,000 larvae a month later. Control rats, fed 500 normal larvae, are completely protected.

"It is possible that if pork were commercially irradiated as a means of protecting human beings and hogs from infection, whatever acquired immunity has developed in the public and in the hog population by naturally acquired subclinical infections gradually would be lost. This may result in more clinical manifestations of the disease, in more severe infections in hogs and ultimately the mortality rate in man may rise to the level experienced in former years. Until a specific cure for the disease is discovered, such a procedure might prove hazardous."

DEFICIENCY DISEASES

SATO, Y. **Liver Biopsy Findings in Children with Nutritional Dystrophy. Studies on the Nutrition of Children in Hirosaki Area (25th Report).** *Tohoku J. Exper. Med.* 1955, Dec. 25, v. 63, No. 1, 93–101, 8 figs. [18 refs.]

"In 30 cases of biopsied liver from children with nutritional dystrophy, plant cell-like appearance of the hepatic cells was found in 22, cloudy swelling in 10 cases, fatty infiltration in 5 cases, diffuse fibrosis in 12 cases, zonal necrosis in 5 cases, basophilia of the hepatic parenchyma in 11 cases, and eosinophilic coagulum in the space of Disse in 2 cases, and a thickening of arterial wall in one case."

PRIETO LORENZO, A. El kwashiorkor. [**Kwashiorkor**] *Med. Colonial* Madrid. 1956, Jan. 1, v. 27, No. 1, 13–58, 4 figs. [Numerous refs.]

SPRUE

Salvesen, H. A. Spruesyndromets patogenese. [**The Sprue Syndrome**] *Nordisk Med.* 1956, Jan. 5, v. 55, No. 1, 8–10. [11 refs.]

The English summary appended to the paper is as follows:—

"The author outlines his conception of the pathogenesis of the sprue syndrome: Primary blocking of the fat absorbing and conducting organs, and the consequences of the absolute or relative undernutrition, including vitamins, which follows. These consequences are seen in the light of a functional hypofunction of the different endocrine organs, especially the hypophysis. The consistent finding of hypotension in the author's own series, even in patients who are able to work, is seen in relation to an existing adreno-cortical insufficiency, which cannot yet be fully characterized. That a functional hypoparathyroidism occurs too, seems well established by the fact that hypocalcemia so often persists and fails to stimulate the parathyroids to hyperactivity."

Paterson, J. C. S. **The Sprue Syndrome.** *Amer. J. Med. Sci.* 1956, Jan., v. 231, No. 1, 92–108. [228 refs.]

HAEMATOLOGY

Hirsch, H. **Incidence of Blood Dyscrasias in the Non-Europeans as seen in Southern Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 555–62. [70 refs.]

From a study of case records of 2 hospitals administered by the Johannesburg Hospital Board, an attempt has been made to deduce the incidence of blood dyscrasias among the 2 racial groups concerned. In addition to studying case notes, the author personally carried out many laboratory tests. There is a detailed table showing the numbers of the various diseases encountered together with a note of the numbers of Europeans and Africans admitted to the hospitals during the period covered. This is followed by a brief report on an investigation aimed at determining normal haematological values in Africans in the neighbourhood. The mean haemoglobin value found among 51 female African nurses and students working at one of the hospitals was 15·46 gm. per cent. Each disease encountered in the survey is briefly discussed and reference is made to the literature relating to its incidence in other regions. It is concluded that idiopathic hypochromic anaemia, pernicious anaemia and essential thrombocytopenia are rare among Africans but nutritional megaloblastic anaemia is relatively common. It is suggested that onyalai is the counterpart of essential thrombocytopenia among them.

Erythroblastosis foetalis is commoner in Europeans than in Africans but haemorrhagic disease of the newborn is more commonly encountered among Africans than Europeans. Leukaemia, Hodgkin's disease and infectious mononucleosis all appeared to be commoner in Europeans than in Africans. *A. W. Woodruff*

Israels, L. G., Suderman, H. J. & Hoogstraten, J. **Thalassaemia in a Scottish Family.** *Lancet.* 1955, Dec. 24, 1318–20, 1 fig. [23 refs.]

The authors describe the occurrence of thalassaemia in 4 members of a Scottish family, with no known Mediterranean ancestors. The clinical, haematological and biochemical findings fully substantiate the diagnosis. That a distant forgotten ancestor may have come from the Mediterranean littoral cannot be excluded and is not unlikely as the Rh chromosome cDe or Ro occurred in this family. This chromosome is relatively rare in Europeans but frequent in Africans and not uncommon in Mediterranean areas. The authors suggest that this family study illustrates the appropriateness of the term " thalassaemia " rather than " Mediterranean anaemia ". [Ogilvie (*Lancet*, 1956, Jan. 14, 108), in comment, does not consider that a syndrome characterized by jaundice, splenomegaly, reticulosis, decreased erythrocytic fragility and a mongoloid appearance has any claim to a word derived from the sea and urges a return to the name " Cooley's anaemia ".] *Frederick J. Wright*

Betke, K. Anomale menschliche Hämoglobine. [**Abnormal Haemoglobins in Man**] *Klin. Woch.* 1956, Feb. 1, v. 34, Nos. 5/6, 113–20, 2 figs. [216 refs.]

A general review and discussion.

Horsfall, W. R. & Lehmann, H. **Absence of Abnormal Haemoglobins in some Australian Aboriginals.** [Correspondence.] *Nature.* 1956, Jan. 7, v. 177, 41–2.

The authors had already failed to detect any evidence of the sickle-cell trait in a group of Australian aboriginals [this *Bulletin*, 1954, v. 51, 100]. They have now extended this study to a search for the presence of haemoglobin E in a similar group.

Blood was collected from 166 aboriginals in 3 localities in Queensland: 148 of the subjects appeared to be of unmixed Australian ancestry. Filter-paper electrophoresis showed that all the haemoglobins present moved as a single band in the position of normal adult haemoglobin controls. This finding ruled out the presence of all known abnormal variants of adult haemoglobin, including haemoglobin E, in these aboriginals.

The authors point out that it is too early to assess the relationship between sickle-cell haemoglobin and malarial infection [*ibid.*, 1954, v. 51, 1143], still less to speculate on the distribution of malaria in relation to other haemoglobins: but it is noteworthy that malaria is believed to be a recent importation into continental Australia and that its aboriginals do not apparently possess multiple haemoglobins: in this respect they differ from most of the older populations of tropical Africa and Asia.

H. J. O'D. Burke-Gaffney

Swindler, D. R. **The Absence of the Sickle Cell Gene in Several Melanesian Societies and its Anthropologic Significance.** *Human Biol.* 1955, Dec., v. 27, No. 4, 284–93. [39 refs.]

"The previous discussion has attempted to elucidate some of the anthropologic problems concerning the sickle cell gene. It appears that the gene has limited ethnologic application and that its utilization as a 'tracer' of Negro ancestry is open to suspicion. The suggestion has been made that the gene never passed eastward of India and that this is a consequence of its relatively recent acquisition in *Homo*. This hypothesis seems even more tenable in view of the data presented here. It is demonstrated that the absence of the gene in Australasia and Melanesia does not substantially alter previous concepts on the origin of these populations."

Stevens, A. R., Jr. & Gill, E. Die Sichelzellanaemie. [**Sickle-Cell Anaemia**] Bericht über vier selbst beobachtete Fälle. *Deut. med. Woch.* 1956, Jan. 6, v. 81, No. 1, 26–9.

The author writes from a United States Hospital in Heidelberg. Because of the many U.S. troops of Negro origin now in Europe there is a need for awareness of the possibility of sickle-cell anaemia being detected among them. The author therefore reviews the disease, and discusses the diagnosis and treatment, for the benefit of doctors who are not familiar with it.

Four cases seen in Germany are described.

H. J. O'D. Burke-Gaffney

Segal, Fay, Grusin, H. & Cassel, R. **Sickle-Cell Anaemia in a Young Coloured Adult Male. Report of a Case.** *South African Med. J.* 1956, Jan. 21, v. 30, No. 3, 63–5, 2 figs. [19 refs.]

"(1) A case of sickle-cell anaemia is reported in a young adult Coloured male.

"(2) The presence of sickle haemoglobin (haemoglobin S) was established by paper electrophoresis, reduced solubility in phosphate buffer solutions and by increased resistance to denaturation by alkalis.

" (3) The disease is rare in South Africa, and in non-European subjects it has only been reported in children of immigrants from areas in which the trait is commonly found."

Chernoff, A. I., Rucknagel, D. & Jim, R. **Hemolytic Mechanism in Sickle Cell-Hgb C Disease.** *Proc. Soc. Exper. Biol. & Med.* 1955, Nov., v. 90, No. 2, 547–50, 5 figs. [11 refs.]

" Red cells from 3 patients with sickle cell-Hgb C disease transfused into normal individuals with and without a spleen, were found to have a survival time of approximately 50 days. The spleen, therefore, does not appear to have a critical role in the hemolysis occurring in this disease. Possible mechanisms for the red cell destruction, based on the per cent of Hgb S present, as well as the role of the spleen during periods of crisis, are discussed."

See also p. 558, Pick, Cristallisations réduvidiques de l'hémoglobine dans un cas de maladie a hématies falciformes (Sickle-Cell Disease) [**Crystallization of Haemoglobin by a *Triatoma* in a Case of Sickle-Cell Disease**]

Rigas, D. A., Koler, R. D. & Osgood, E. E. **Hemoglobin H. Clinical, Laboratory, and Genetic Studies of a Family with a Previously Undescribed Hemoglobin.** *J. Lab. & Clin. Med.* 1956, Jan., v. 47, No. 1, 51–64, 7 figs. [38 refs.]

" Eight members of a Chinese family have been studied. Three of these have a previously undescribed hemoglobinopathy characterized by hypochromic microcytic anemia refractory to iron therapy, reticulocytosis, splenomegaly, increased red-cell resistance to hypotonic saline solution, and shortened red-cell survival. The inheritance of this condition is not typical of a dominant gene. The abnormal hemoglobin H accounts for 35 to 40 per cent of the total; fetal hemoglobin is present in slightly increased amounts, and the remainder is normal adult hemoglobin. Hemoglobin H differs from normal adult hemoglobin in having a more rapid electrophoretic mobility on the alkaline side of the pH range, and a lower isoelectric point.

" Hemoglobin H precipitates in an irreversible form from solution and in the red cells, forming intraerythrocytic inclusion bodies. This alteration occurs at a more rapid rate with increasing acidity or decreasing oxygen tension but appears to be due to an inherent molecular instability. Attempts are made to relate the characteristics of the abnormal hemoglobin to the morphologic changes in the red cells and to the pathogenesis of the disease."

VENOMS AND ANTIVENENES

CHRISTENSEN, Poul Agerholm [M.B., Dip. Bact.]. **South African Snake Venoms and Antivenoms.** pp. v + 129, 43 figs. 1955. Johannesburg: The South African Institute for Medical Research, P.O. Box 1038.

The author has collected most of the available information on the venoms of South African poisonous snakes in a book which is written as a continuous account of his own investigations and those of others, rather than as a review. This makes for lucid and consecutive arrangement and affords an opportunity for him to make some interesting points including, for instance, his personal preference for the expression " antivenom " rather than " snake venom antitoxin " or " antivenene ".

The South African snakes (with their appropriate common names) are first grouped into Opisthoglypha, Proteroglypha and Solenoglypha, and subdivided into zoological families, genera and species. A note on the appearance and yield of venom of individual snakes is followed by a general account of the effects of elapine, viperine, and colubrine venoms, including some very interesting miscellaneous information covering such things as the action of venom on protozoa, fish, reptiles, tadpoles and mosquito larvae, and upon snakes of the same and other genera and species.

The estimation of the potency of venoms in warm-blooded laboratory animals, usually mice, is discussed in some detail. Among other points considered are (i) the effects of elapine venoms on respiration and the nervous system, muscles and the circulatory system; (ii) the action of venoms, especially viperine, on blood, under headings of haemolysis, blood sugar and the clotting mechanism. There is an interesting discussion on the various enzymatic activities and content of venoms, including proteolytic enzymes, phosphatase, cholinesterase, hyaluronidase and amino-acid oxidase. The enzyme inhibitors in venoms, including cytochrome oxidase inhibitor, are mentioned, although work on this subject has mainly been carried out on Asian snakes.

A full account of the physical and chemical properties of the venoms of *Naja flava* (Cape cobra) and of *Bitis arictans* (puff adder), is followed by some information on a variety of points, including the electrophoretic patterns, absorption spectra, stability, methods of sterilization and inactivation. Methods of production, purification and concentration of antivenoms are given in useful detail. The estimation of potency of antisera is described in relation to *N. flava* and *B. arictans* venoms, and there is a section on cross-neutralization *in vivo* and *in vitro*. Monovalent enzyme-refined antisera prepared against the venoms of *N. flava*, *Sepedon* [*Hemachatus*] *haemachates*, *N. naja*, *B. arietans*, *B. gabonica* and others, were tested by intravenous assay in mice against the venoms of the above snakes and those of *Causus rhombeatus*, *Cerastes cornutus*,

Echis carinatus and *B. gabonica*. A polyvalent serum, made from the venoms of *N. flava* and *B. arietans* was included in the tests.

It was found that the polyvalent antiserum was active against the venom of *N. flava*, *N. haje*, *N. naja* and *S. haemachates*, but only weakly active against the venom of *N. nigricollis* and *N. melanoleuca*. It had considerable neutralizing powers against the venom of *B. arietans* but not against that of *B. gabonica* or *B. cornuta*. Very little neutralizing power against the venom of *Dendraspis* spp. was observed with the polyvalent antiserum or antisera prepared from either *N. flava* or *S. haemachates* venoms.

The author concludes that the polyvalent serum is active and can be used with confidence against the venoms of *N. flava*, *N. haje*, *S. haemachates* and *B. arietans*.

A serum prepared with venoms of *B. arietans* and *S. haemachates* would be better against the latter, to which larger groups of people are likely to be exposed, and would be effective against *N. flava* and *N. naja* venoms: it would moreover be much more effective against *N. nigricollis* venom.

The best solution is to make a polyvalent serum from the venoms of all three—*N. flava* (Cape cobra), *S. haemachates* (ringhals) and *B. arietans* (puff adder). The preparation of this antiserum has begun.

Polyvalent antisera thus offer protection against the venoms of all the important elapine snakes *except the mambas* (*Dendraspis* spp.). The venom of the latter and of *N. melanoleuca* requires specific antisera.

The statistics of snake bite in South Africa are considered in full, including such points as seasonal incidence, body sites bitten, species responsible, geographical distribution, etc.

The book is completed by brief accounts of clinical aspects of snake bite and treatment, including an illuminating summary of alleged antidotes.

This is an important book, especially for those actively concerned with the physiological aspects of venoms and with antivenom production. In its pages is collected information which is otherwise scattered among a wide range of literature not always easy to obtain. This material is lucidly and authoritatively dealt with and the author is to be congratulated on the general clarity of his text. This is not a book for the general reader but every medical library should possess a copy.

B. G. Maegraith

Doery, Hazel M. **Purine Compounds in Snake Venoms.** [Correspondence.] *Nature*. 1956, Feb. 25, v. 177, 381–2, 1 fig.

Fraenkel-Conrat, H. & Singer, B. **Fractionation and Composition of Crotoxin.** *Arch. Biochemistry*. 1956, Jan., v. 60, No. 1, 64–73. [18 refs.]

TOXOPLASMOSIS

Fesevur, H. J. J. Toxoplasmose. [**Toxoplasmosis**] *Nederl. Tijdschr. v. Geneesk.* 1956, Feb. 4, v. 100 (i), No. 5, 342–6. [20 refs.]

Proc. Roy. Soc. Med. 1955, Dec., v. 48, No. 12, 1067–76 (Sect. Comp. Med. with Sect. Path.), 1 fig. [42 refs.] **Discussion on Toxoplasmosis** [Siim, J. C.; Beattie, C. P.; Cathie, I. A. B.].

Dr. Siim opens the discussion with an enumeration of the lesions caused by acquired toxoplasmosis infection, with details of the type associated with lymphadenopathy. Illustrative cases of each form are given in detail, and the isolation of the parasite from lymph node biopsy is detailed. The results obtained from the use of the Sabin dye test in these cases are listed. The differential diagnosis is outlined.

Prof. Beattie discusses the effects of infection in animals in general and in human beings in particular, together with the possible modes of infection. At the moment it would appear that the commonest form of acquired toxoplasmosis in man is lymphadenopathy of the "glandular fever" type, but much more work requires to be done to exclude this infection as the cause of cases of stomatitis, sore throat, gastro-enteritis, and atypical respiratory lesions.

Dr. Cathie is concerned with the laboratory diagnosis of the condition. Isolation from infected material by intraperitoneal inoculation of mice is the ultimate proof, but, failing this, adequate information can be obtained from the two serological methods commonly used—the dye test of Sabin and Feldman and a complement-fixation [CF] test with antigen prepared from egg membranes. In this respect it would appear that the Westphal antigen [this *Bulletin*, 1952, v. 49, 320], obtained from toxoplasmas in mouse peritoneal fluid, is too non-specific for accurate interpretation of the results. In general, active infection requires that both serological tests be positive, while once positive the dye test remains so at a low titre, the CF test becoming negative. Details of interpretation are given.

J. C. W. MacFarlane

Kozar, Z. Przegląd pozostałych, aktualnych w Polsce zagadnień parazytologii lekarskiej. [**A Review of Other Problems of Medical Parasitology of Importance in Poland**] *Wiadomości Parazytologiczne.* Warsaw. 1955, v. 1, 83–103. [15 refs.] German summary.

The author gives a review of work on parasitology which has been carried out in Poland during the last 2 years. Antigens prepared from the peritoneal exudate of mice and from chorioallantoic membranes have been used in complement-fixation tests for the diagnosis of toxoplasmosis; positive results were obtained in 24 (11 per cent.) of 202 inhabitants of Lublin and in 7·5 per cent. of 185 infants and children in

Dantzig. Positive results were obtained with the Frenkel test in 25 per cent. of 681 healthy persons in Dantzig, and in 51·5 per cent. of 961 patients in mental hospitals. Experiments with rats have shown that administration of oestrin and progesterone will cause an increase in susceptibility to *Toxoplasma* infection. Work on trichomoniasis, paragonimiasis, cysticercosis and trichinosis is also reviewed. *D. J. Bauer*

Vermeil, C. Enquête sérologique sur la toxoplasmose humaine dans le Nord de la Tunisie. [**A Serological Survey of Toxoplasmosis in Northern Tunisia**] *Arch. Inst. Pasteur de Tunis.* 1955, Dec., v. 32, Nos. 3/4, 407–10. [12 refs.]

Owing to technical difficulties with the dye test the author chose the complement-fixation test to make a serological survey of toxoplasmosis in northern Tunisia; complement-fixing antigen was prepared from mouse peritoneal exudate. Of 140 routine sera on which tests for syphilis were negative 11 per cent. were positive for toxoplasmosis. One out of 8 sera positive for syphilis was positive also for toxoplasmosis, while of 18 sera from patients suspected on clinical grounds of having toxoplasmosis 3 were positive. Out of 9 patients with malaria 7 gave positive tests for toxoplasmosis, and this observation may invalidate serological surveys in countries where malaria is endemic. [See also Balozet, this *Bulletin*, 1956, v. 53, 101.] *I. A. B. Cathie*

Hulland, T. J. **Toxoplasmosis in Canada.** *J. Amer. Vet. Med. Ass.* 1956, Jan. 15, v. 128, No. 2, 74–9, 3 figs [47 refs.]

"1) Fatal cases of toxoplasmosis have been seen in 8 dogs, 1 cat, 1 mink, and in three outbreaks on chinchilla ranches. Apparently the infection in all these animals was contracted in Ontario.

"2) Toxoplasmosis was diagnosed in the mink on the basis of histopathological findings. This species had not previously been reported as contracting the disease.

"3) A review of the pertinent literature is made."

Varela, G., Roch, E. & Vázquez, A. Virulencia, cultivo, polisacáridos, toxinas y la prueba del colorante, estudiados con una cepa de *Toxoplasma gondii*. [**Virulence, Cultivation, Polysaccharides, Toxins and Dye Test in a Strain of** *Toxoplasma gondii*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, June, v. 15, No. 2, 73–80. [22 refs.] English summary.

The authors describe the characteristics of a strain of *Toxoplasma gondii* isolated by them in Mexico. After undergoing 258 mouse passages

by intraperitoneal inoculation, it kills the animals in 4–5 days. When inoculated by the nasal route the parasites establish themselves in large numbers in the lungs. The infection is also lethal to golden hamsters, in which congenital transmission was demonstrated. Rabbits and guinea-pigs were also susceptible to infection with this strain, but its duration in these animals was longer. However, in rats the infection runs a latent course. Attempts to infect lizards failed, though the toxoplasms survived in their peritoneal cavity from a week to a fortnight.

Among other observations it is noted that the Mexican strain was cultivated in human embryonic tissue. With the " Alcian blue 8GN 150 " stain, the presence of polysaccharides in *Toxoplasma* was demonstrated. Experiments were also carried out to determine the presence of " toxotoxin " in the parasites, by intravenous inoculation of normal mice with the peritoneal exudate of infected mice. In this case death ensued in several minutes. However, a suspension of egg-white of the same viscosity as the exudate produced the same effect, while the intravenous injection of mice with the peritoneal exudate of mice, which succumbed to infection, failed to kill them rapidly. From these experiments it is concluded that " toxotoxin " does not behave like a true toxin.

Dye tests were carried out with human sera from different parts of Mexico, with positive results in 37·5 per cent. of 104 children and in 26·7 to 64·7 per cent. of 740 adults. Similar tests with the sera of wild rats revealed from 15·9 to 34·6 per cent. positive reactions. The proportion of these was even higher (50 per cent.) in rats infected with Sarcosporidia, *Trichinella* and filariae. *C. A. Hoare*

Tolentino, P. Sui presunti rapporti tra toxoplasmosi inapparente e localizzazioni nervose di altre malattie infettive. [**Connexion between Latent Toxoplasmosis and other Infectious Diseases with Localization in the Central Nervous System**] *Giorn. di Malattie Infettive e Parassit.* 1955, Oct., v. 7, No. 10, 579–80. [10 refs.]

In a number of instances reported in the literature, positive serological reactions for toxoplasmosis were obtained in cases of tuberculous meningitis. It was suggested that in such cases toxoplasmosis either simulated the meningeal symptoms of tuberculosis or favoured the localization of tubercle bacilli in the central nervous system.

In order to throw light on the possible connexion between latent toxoplasmosis and other diseases affecting the nervous system, the author carried out an examination by the dye test of over 1,113 persons in Genoa, of whom (1) 1,003 belonged to the general population, (2) 55 had nervous symptoms attributable to toxoplasmosis, (3) 22 were suffering from tuberculous meningitis, and (4) 33 from poliomyelitis. The reaction was positive in 35 per cent. of the 1st group, in 60 per cent. of the 2nd, in 50 per cent. of the 3rd and in 27 per cent. of the 4th. Among these

cases, only 2, represented by a 5-year-old child suffering from tuberculous meningitis and by a 9-year-old child suffering from poliomyelitis, responded to a titre of 1 in 256, whereas in all the other persons, whose ages ranged from 1 to 42 years, the titres were lower.

It is concluded that while no definite evidence was obtained regarding the connexion between toxoplasmosis and the other diseases, the two cases in question might be significant. *C. A. Hoare*

Smith, C. & Perkins, E. S. **The Preliminary Results of the Treatment of Uveitis with Daraprim.** *Proc. Roy. Soc. Med.* 1956, Jan., v. 49, No. 1, 24–6 (Sect. Ophthalm. 6–8).

Smith described experimental studies which indicated that Daraprim [pyrimethamine] gave encouraging results in the treatment of toxoplasmosis induced experimentally in mice. Unfortunately, where rabbits were concerned, while the acute iridocyclitis was diminished by Daraprim there appeared to be no effect upon the choroidal lesion, whether the drug was given systemically or subconjunctivally. In addition cataractous changes were noticed in the lenses of these animals if Daraprim had been given subconjunctivally but fortunately not when the drug had been given systemically. It was, however, felt that these results were sufficiently encouraging for Daraprim to be given a clinical trial, which was described by Perkins. Consecutive cases of active uveitis were treated whether or not the tests for toxoplasmosis were positive.

While the results were encouraging it was not statistically possible to say that Daraprim did exert a favourable effect on uveitis treated with it, and again it was not possible to argue from the results that there had been a significant improvement in the toxoplasma positive cases treated with Daraprim over those with a negative toxoplasma reaction. The possibility that this was so has not been excluded by these results and the clinical trials are continuing.

It would appear that Daraprim gives better results when given in higher doses, but is not, unfortunately, free from toxic effects.

D. P. Choyce

Eyles, D. E. & Jones, Frances E. **The Chemotherapeutic Effect of Pyrimethamine and Sulfadiazine on Toxoplasmosis of the Norway Rat.** *Antibiotics & Chemotherapy.* New York. 1955, Dec., v. 5, No. 12, 731–4.

This paper describes experiments on the chemotherapy of toxoplasmosis in the Norway rat which, unlike the mouse, develops chronic infections which persist for a long time. Albino types weighing about 175 gm. were inoculated intraperitoneally with 1 million *Toxoplasma* organisms. Deaths from the untreated disease were rare, but subinoculation over a period of months into clean mice indicated the persistence of infection.

Drugs were given in diet over a period of 14 days and the intake of drug could be calculated. Brain tissue from treated and control rats was inoculated into fresh mice to find whether cure had been effected, but the method was not entirely satisfactory. The Sabin-Feldman dye test was also carried out with the serum of treated rats. The authors came to the conclusion that the two drugs used were effective against the parasite during multiplication, but not against pseudocysts. When administered early in the infection pyrimethamine alone and with sulphadiazine had a curative effect, but showed little effect in chronic infections. There was no correlation in the results of the dye and inoculation tests in the animals proved to be infected or those non-infected.

J. D. Fulton

DERMATOLOGY AND FUNGUS DISEASES

Neuhauser, Irene. **Black Grain Maduromycosis caused by** *Madurella grisea*. **Report of the First North American Case and its Response to Therapy with Diaminodiphenylsulfone.** *Arch. Dermat.* 1955, Dec., v. 72, No. 6, Sect. 1, 550–55, 4 figs. [20 refs.]

"A case of black grain maduromycosis of the foot caused by M. grisea in a Negro woman born in the United States is described. This is the first case caused by this species to be reported from North America. The causative organism was identified by cultural and biochemical procedures. Promising therapeutic results were observed with 4,4′-diaminodiphenylsulfone (D.D.S)."

Floch, H. & Saccharin, H. Sur un cas de maladie de Lutz. [**A Case of South American Blastomycosis**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 5, 686–91.

The case occurred in French Guiana where the authors had not hitherto encountered the disease.

Vieira, F. & Vieira, L. D. Sôbre dois casos de granuloma paracoccidióidico. Micose de Lutz. [**Two Cases of Paracoccidioidal Granuloma**] *Rev. Assoc. Méd. Minas Gerais.* 1954, Apr.–Aug., v. 5, Nos. 1/2, 47–9, 2 figs.

TROPICAL OPHTHALMOLOGY

BAKRY, G. **Preliminary Investigations of the Seasonal Incidence of *Musca sorbens* Wied. in relation to Acute Ophthalmias in Egypt.** *J. Egyptian Med. Ass.* 1955, v. 38, No. 9, 507–11, 2 figs.

The author collected 1,484 flies from various breeding places in an Egyptian village between March and November 1952. Of these 83 per cent. were *Musca domestica vicina*, 11 per cent. *M. sorbens*, and 5 per cent. *M. d. cuthbertsoni*. Three specimens of *M. lusoria* were also found, stated to be a new record for Egypt.

In view of the well known habit of *Musca sorbens* of resting on children's eyes, the author collected 299 flies from the faces of children aged 5 to 8 years, by means of a special net, which is described and illustrated.

The monthly and seasonal results are shown in a table. *M. sorbens* constituted half of the flies found on children's faces, being 59·8, 61·7 and 42·0 per cent. in spring, summer and autumn respectively.

The possible bearing of these preferences in the propagation of ophthalmia, and in particular of acute seasonal conjunctivitis, is noted.

H. J. O'D. Burke-Gaffney

HEAT STROKE AND ALLIED CONDITIONS

COLLINS, C. P. **Health and Efficiency in Men of the Royal Navy under Thermal Stress.** *J. Roy. Nav. Med. Serv.* 1955, v. 41, No. 4, 201–17, 2 figs. [25 refs.]

The problem of the effects of severe thermal environment on the comfort and mental and physical health of ships' companies in tropical waters was brought to a focus during the last war. Increased personnel, increased armament reducing living and working space, increased safety precautions reducing daylight and fresh air, increased "wild heat" produced by engines to maintain full power, and battening down in dangerous waters, all added to the strain of already hot and humid conditions. The problem became one of maintaining the most efficient fighting machine over long periods while realizing that the moral and physical condition of the men was as important as the armament strength. With this in mind investigations carried out over the last 50 years on ventilation and the thermal environment in relation to human health, comfort and working efficiency are reviewed by the author.

The standard technique of measuring environmental warmth adopted by the Royal Navy is that specified in a memorandum by BEDFORD [*Bull.*

Hyg., 1946, v. 21, 595]. The effective temperature scale has proved to be the most accurate index of physiological stress yet found and the Royal Naval Personnel Research Committee have recommended that for men in the tropics doing moderate work and wearing minimum clothing the upper desirable limit should be taken as 80°F. corrected effective temperature and the upper tolerable limit as 86°F. corrected effective temperature. Workshops, galleys and machinery compartments often have temperatures well above these limits. Mackworth (*Roy. Soc. Sci. Conf. Rep.*, 1946, v. 1, 423) found that both mental and physical work deteriorated at effective temperatures ranging from 83° to 87°F. Trained men suffered less than men of ordinary ability.

The importance of acclimatization and the correct teaching on salt and water intake is stressed. Graphs are given by the author to show trends since 1890 in dysentery, tuberculosis, mental disorders, respiratory and digestive disorders, connective tissue and skin diseases and injuries (other than those due to enemy combat) among men in the Home Fleet and the East Indies Squadron. The high incidence of digestive and connective tissue and skin disorders in the East Indies Squadron is noted. In the Home Fleet and the East Indies Squadron there are both an increased recognition and a high incidence of mental disorders in recent years.

Suggestions for the improvement of working conditions in tropical waters include the introduction of air conditioning plant, though size, weight and cost limit its use, the control of radiant and " wild heat " by lagging and insulation, the reduction of moisture from steam leaks, the correct siting of intakes and exhausts, the free use of punkah louvres, forced exhaust systems and electric fans to increase air velocity, and the adequate provision of laundries to preserve cleanliness and health. If the mean total heat gain for a compartment during trials is measured, the thermal conditions to be expected in the ship when in the tropics can be estimated. Unsatisfactory conditions can thus be remedied before the ship leaves home waters. The period of service in the tropics should not be more than 2 years and shore leave should be given whenever possible.

Barbara Tredre

Thaysen, J. H. & Schwartz, I. L. **Fatigue of the Sweat Glands.** *J. Clin. Investigation.* 1955, Dec., v. 34, No. 12, 1719–25, 8 figs.

" These results suggest that the decrease in reflex sweating produced by environmental heat is due to fatigue of the glandular units and not to decreased central nervous stimulation. Apparently sweating can continue indefinitely at the same rate only if the demand on the secretory mechanism does not exceed simultaneous processes that operate to restore secretory function. When the demand upon the secretory mechanism exceeds the capacity for restoration of function, the sweating rate decreases."

Pearson, A. T. **Epidemic Hyperpyrexial Heat Stroke.** *Med. J. Australia.* 1955, Dec. 10, v. 2, No. 24, 968–70.

Deaths from hyperpyrexial heat stroke have not been recorded frequently in Australia, but during February 1955 Perth experienced most unusual weather conditions which led to the death of at least 14 people from heat hyperpyrexia. From February 14 to 17 six inches of rain were recorded and from the 19th the temperature rose rapidly and with it the humidity, and the heat wave lasted until the 28th. On the third day the maximum wet bulb temperature was 80·2°F., the minimum 74·8°; the dry bulb temperature was 105·0° and the minimum 83·3°F., and there were 6 deaths. In Perth a wet bulb temperature of 80°F. is very rare and it is generally considered that a wet bulb maximum temperature of 85°F. or over is incompatible with life. The average maximum wet bulb temperature for February is 68·9°F.

Autopsies were performed on 12 males. The significant findings at autopsy were: extensive dark purple post-mortem staining with black petechiae in the skin; the lungs were cyanosed with gross pulmonary oedema. There were petechial haemorrhages on the pericardium and venous congestion of the abdominal viscera.

Body temperature readings were obtained in 6 cases. The highest was 111°F., the next 108°F.

Most cases were incorrectly diagnosed at first. Pontine haemorrhage was diagnosed four times on the signs of hyperpyrexia, collapse, convulsions and coma. It would seem that hyperpyrexial heat stroke is not as rare in tropical and subtropical Australia as was previously believed.

Philip Manson-Bahr

TROPICAL ULCER

Castellani, A. Observations sur les ulcérations de la jambe cosmopolites et tropicales les plus fréquentes: ulcus varicosum, ulcus varicosoides, ulcus lueticum, macroulcus perstans, ulcus tropicum, ulcus veldis, ulcus pyogenicum, ulcus tropicaloides. [**Observations on the Commoner Cosmopolitan and Tropical Ulcers of the Leg**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1955, Nov., v. 36, No. 11, 587–629, 27 figs. [25 refs.]

Kessler, P. N. Ein Beitrag zur Behandlung des Tropengeschwürs. [**Treatment of Tropical Ulcer**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Apr., v. 6, No. 1, 85–91, 6 figs. [13 refs.]

The English summary appended to the paper is as follows:—

"Pyrgasol 'Wander' (undecanoyl-p-aethoxy-beta-dimethyl-benzyl-ammonium chloride), a new chemical compound of detergent and

disinfecting properties, was used for the treatment of tropical ulcers in a plantation hospital in Liberia. 200 ccm of a 0·05 per cent solution were applied daily as a permanent drip for two hours until the ulcerated surface became clean. The treatment generally lasted for ten days and was followed by dressings with 0·2 per cent furacin ointment. Results were by far better than those obtained by other methods and made skin grafts unnecessary."

MISCELLANEOUS DISEASES

JAFFÉ, L. **Otorhinolaryngology in the Tropics.** Reprinted from *Otolaryngology.* 1955, v. 5, Chapter 19, 59 pp., 12 figs. [205 refs.]

In the present paper the author has enlarged upon his previous communications on the same subject [see this *Bulletin*, 1952, v. 49, 551 *bis*]. After pointing out the paucity of information on the specialized topic, together with the limitations imposed by social backwardness, he animadverts upon the catarrhal infections of the upper respiratory tract which are frequent, but invariably of a light nature, while sinusitis has not been seen in pure Panamerican Indians. With the spread of tuberculosis, tuberculous infection of the larynx is very common and is a frequent concomitant of leprosy. Lupus of the upper respiratory tract, on the other hand, has not been seen by the author in the tropics, while dermal lupides are very rare. Tropical otitis externa, " Panama ear ", " Singapore ear " or " hot weather ear " is a frequent infection in all warm countries. It is a very acute and painful affection to which much attention has been paid. Its true aetiology remains obscure, and, contrary to general belief, its connexion with bathing in contaminated water has not been established. The legitimacy of " ear fungus " is doubtful. After a review of all the fungi and organisms which have been suspected, it seems that *Pseudomonas pyocyanea* is probably the principal offender. Workers in the S. Pacific found penicillin mixed with boric acid and sulphathiazole, the so-called PSB powder, inserted into the meatus by means of a powder blower, most satisfactory.

Tropical vasomotor rhinitis, or tropical hay fever, is one of the most frequent rhinological conditions in the tropics. The greater part is due to allergy and it is really the counterpart of our own hay fever; it is caused by pollens, most of which are unknown. There is no seasonal incidence, because in the tropics the trees are in constant pollination.

The account then deals with tropical parasites and diseases in which the mouth, nose and ear are involved. Parasites are *Ascaris lumbricoides*, leeches, and rhinosporidia; generalized diseases are malaria, yaws, with special reference to gangosa and goundou, bejel and leishmaniasis.

Blastomycosis of the S. American type causes considerable ulceration of the mouth and face. Bartonellosis, smallpox, plague, scrub typhus and onyalai, all come under review. Myiasis, schistosomiasis, filariasis, granuloma venereum, beriberi, pellagra, tropical sprue, tropical macrocytic anaemia and scurvy all have complications which come under this heading. *Philip Manson-Bahr*

Senior, B. & Braudo, J. L. **Favism. Report of a Case occurring in Johannesburg.** *South African Med. J.* 1955, Dec. 31, v. 29, No. 53, 1264–6, 1 fig.

"A case of haemolytic anaemia due to broad beans (*Vicia faba*) in a 12-year-old Greek boy is described. To the best of our knowledge this condition has not been recorded previously in South Africa.

"Broad beans are fairly widely grown throughout South Africa. It is suggested that an awareness of the condition will lead to the recognition of further cases."

Berman, C. **Onyalai, an Acute Form of Idiopathic Thrombocytopenic Purpura.** *Amer. J. Clin. Path.* 1955, Dec., v. 25, No. 12, 1349–58. [20 refs.]

This paper is based on personal observation of 9 recent cases at Maraisburg, Transvaal. An average of 3 or 4 patients are seen there annually. Five were of the Bechuana tribe, two of the Shangaan, and one each of the Chopi and a North Rhodesian tribe.

The bullae on the buccal and labial mucosa, tongue, palate and, less often, the uvula measured 2 mm. to 2 cm. in diameter. They were multiple, red-blue to black, and raised above the mucous surface. Bullae also appeared on the trunk and legs, and conjunctival haemorrhages were seen in 4. Extensive haemorrhages from the gastro-intestinal and urinary tracts were less frequent, but severe rectal bleeding was the main manifestation in one case. Thrombocytopenia was constant and in 5 cases blood platelets were absent from the blood smears.

On recovery the blood platelet count slowly returned to normal. The blood showed a normochromic or hypochromic anaemia, depending upon the blood loss, and either leucocytosis or leucopenia was observed. The bleeding time was prolonged.

The spleen was enlarged in 2 but this is held to be of no special significance since it is common where malaria is hyperendemic.

The clinical course depended on the extent of the haemorrhage. A high death rate has been reported by Strangway and Strangway [this *Bulletin*, 1949, v. 46, 860], but no deaths occurred in the present series.

The cause, like that of essential thrombocytopenia, is unknown.

Immediate intravenous transfusion with 20 or more ounces of matched

citrated whole blood is essential, especially in cases with persistent haemorrhage. Intramuscular injection of 20 ml. of citrated whole blood was used, either alone or in conjunction with intravenous transfusion. No known drug appears to be effective in controlling the haemorrhagic state in Onyalai.

Details are given of each case and are also tabulated. There is a useful table of cases and death rates recorded by other authors.

Philip Manson-Bahr

Indian Council of Medical Research: Liver Diseases Sub-Committee [Khanolkar, V. R., Chairman]. **Infantile Cirrhosis of the Liver in India. (Synonym—Infantile Biliary Cirrhosis.)** *Indian J. Med. Res.* 1955, Oct., v. 43, No. 4, 723–50, 18 figs. on 6 pls. [Numerous refs.]

The Sub-Committee defines infantile cirrhosis of the liver as "a disease peculiar to India affecting infants and young children, with a tendency to run in families. It is characterized in the early stages by enlargement of the liver which is felt to be hard and usually also of the spleen, with ascites and jaundice superimposed in the later stages. Its onset is insidious with vague symptomatology, course variable but generally rather slow and termination usually fatal. Its aetiology is unknown."

In this very interesting and admirable report the clinical, epidemiological, pathological and aetiological problems of the syndrome are discussed in full.

The clinical course is usually divided into three well-defined stages. In the *early* stage the onset is nearly always insidious. In a few cases there is a definite history of an acute episode of fever and jaundice resembling acute infective hepatitis. The liver is just palpable; the spleen may be palpable. There may be a history of having passed pale stools or highly coloured urine, but jaundice is rare. The *intermediate* stage is characterized by pale stools, subicteric tint, prominent abdomen, enlarged liver reaching as far as the umbilicus. The liver edge is sharply defined and firm; it has a so-called "leafy" feel. There may be oedema and ascites. The child is irritable and prone to secondary infections. In the *late* stage jaundice becomes obvious and increases. Ascites develops and superficial veins become prominent in the abdominal wall. The liver is enlarged but may be less so than in the intermediate stage. The edge is hard and often smooth. Stools are clay-coloured and offensive. The spleen is palpable. Haemorrhagic complications are common. Bile pigments and salts together with albumin appear in the urine. There may be generalized anasarca and irregular fever. Death occurs in cholaemia or from intercurrent infection.

Diagnosis is difficult in the early stages, but an enlarged firm liver with a sharp margin in a child within the age-group of 1 to 3 years is very

suggestive. In the later stages diagnosis is much easier. Liver biopsy may be helpful.

With regard to treatment the Sub-Committee state: " No convincing evidence has so far been produced to show that the natural course . . . is in any way modified by the several regimes which have been advocated. . . ." This statement covers the various nutritional regimes.

The pathological progress of the disease has been studied in material obtained by biopsy and at autopsy. The earliest change is a patchy but widespread liver cell degeneration associated with a mild cellular reaction in Glisson's capsule and sometimes the sinusoids. Condensation of reticulin fibres in the portal tracts follows, with disruption of the *lamina limitans* and the formation of pseudolobules. The fibrosis is " truly portal to start with ", except in a few cases where liver cell necrosis may be progressive and diffuse replacement fibrosis occurs. There is at first some sign of regeneration but eventually the fibrosis extends and wide areas of parenchyma become replaced by fibrous tissue. The sequence suggests a primary cellular degeneration leading to necrosis. There may be repeated episodes of this sort but eventually structural disorganization occurs with consequent disturbances in intralobular circulation. The processes finally become irreversible and progressive. Biochemical changes follow the clinical picture. Toxic, nutritional and other factors including blood group incompatibility are considered not to be direct aetiological factors. The evidence, however, strongly favours the possibility of an infective factor, probably a virus. The Sub-Committee make suggestions regarding future study of this interesting disease.

B. G. Maegraith

Kouwenaar, W. **Cancer of the Stomach in the Tropics.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Dec., v. 7, No. 4, 302–14. [Numerous refs.]

For estimating the incidence of cancer of the stomach in the tropics there are 3 kinds of available statistics, (1) post mortems, (2) pathological material obtained by surgical intervention, often mixed with autopsy material, and (3) clinical statistics. (1) The difficulty with post-mortem statistics is the shorter life span in tropical countries which must be taken into account when comparing the figures with those from temperate countries. Mortality from infectious diseases is high, thus diminishing the relative incidence of cancer deaths, and the high frequency of certain tumours such as cancer of the liver, buccal cancer and vesical cancer in certain countries lowers the ratio of gastric cancer to all cancer cases in those countries. (2) Statistical material from pathological institutes is unreliable, as it includes an undue proportion of external cancers and those removed by operation. (3) Clinical statistics are subject to error of diagnosis and varying social conditions and willingness of the people to consult a doctor.

Table I shows post-mortem statistics from South Africa and Uganda. The percentage of gastric cancers to all cancers in males was found to vary from 8·9 in South Africa to 17·5 in Rhodesia, against 29·8 in Europeans in Johannesburg. Reports of pathological institutes from various parts of Africa show figures varying from 1·7 in Dakar to 7·8 in Nigeria. The clinical figures are of little value, but one series reported that an average of 0·141 per 1,000 Africans treated in hospital suffered from gastric cancer against 0·865 per 1,000 European patients.

Autopsies and clinical statistics suggest that cancer of the stomach is more common in people of African extraction living in the Caribbean area than in Africa itself, and this is also the case in the U.S.A., where available figures show 17·5 per cent. of deaths of white males and 24·2 per cent. of deaths of coloured males from cancer as due to cancer of the stomach.

In Malays the percentage of gastric cancer to all cancers was 1·3 for all ages, but 3·4 for autopsies on adults, whereas for Chinese it was 12·2. In Sumatra the author (*Acta Union Internat. contre le Cancer*, 1951, v. 7, 61) found 25·8 per cent. among Chinese adult estate labourers; he considers that this indicates a real racial difference.

In Vietnam 4,874 pathological specimens of malignant disease showed a difference between the North with 14·3 per cent. of all cancers affecting the stomach in males, and the South with 2·3 per cent. The figures may be influenced by the greater number of liver cancers in the North and of buccal cancers in the South, but the difference appears to be real.

Recent studies have shown that wide differences in the incidence of certain diseases, cirrhosis and cancer of the liver, perhaps also vascular diseases such as thrombosis and coronary infarction, are not related to race, but to a different way of life—diet, greatly influenced by religion, is of special importance.

The incidence of cancer of the stomach in Indonesia runs parallel with that of gastric and duodenal ulcers, the same difference between Malays and Chinese being evident. *W. L. Harnett*

BERMAN, C. **The Aetiology of Primary Carcinoma of the Liver—with special reference to the Bantu Races of Southern Africa.** *South African Med. J.* 1955, Dec. 17, v. 29, No. 51, 1195–8. [38 refs.]

Primary carcinoma of the liver is rare among the peoples of Western Europe and North America, but remarkably common among the inhabitants of Africa and certain parts of Asia. Geographically the areas of known or suspected high prevalence extend from the West African coast along the south-eastern and eastern portions of Africa, across eastern and south-eastern Asia, to and including Indonesia, the Philippines, China and Japan. It is rare in Western people, irrespective of which continent they live in. The post-mortem rate was 0·1 per cent. in Europe and 0·3 per cent. in the United States of America; the relative

frequency of primary liver cancer to all other carcinomata was 1·2 per cent. in Europe and 2·5 per cent. in the U.S.A.

Among the migratory Bantu labourers of the Witwatersrand gold mines, a group of fit young men hailing from various tropical and sub-tropical regions, primary liver cancer was responsible for 90 per cent. of all carcinomata, while in young West African soldiers stationed in Nigeria during the last war it accounted for 70 per cent. of all carcinomata. In Africa the relative frequency of primary liver cancer to all other cancers at autopsy has been found to vary from 30 to 50 per cent. in different localities. In Indonesia its percentage frequency to other forms of malignancy was 79·3 for male Javanese, 31·5 for male Chinese and 6·2 for female Javanese. It is predominantly a disease of young males among Africans and Indonesians, occurring chiefly under the age of 40 years; in other races it is commonest in or after middle age, but the tumour has been found in children of all ages.

Primary liver cancer has been produced experimentally in laboratory animals by "butter yellow" (p-dimethylaminoazobenzene), by aminofluorene or by other compounds of known composition, which are specifically carcinogenic for the liver and whose actions are controlled by dietary factors, especially deficiency of protein and of B vitamins. There is evidence that the frequency of this disease varies with environment, even in the same race; on the Witwatersrand mines it was found to be 6 times as frequent in the Bantu from Portuguese East Africa as in those from South Africa, although there is little genetic difference between them; the early age incidence suggests that the cause of the malignancy begins to operate early in life.

Cirrhosis of the liver on account of its frequent association with primary liver cancer, and its high incidence among the very races prone to this tumour, is commonly regarded as an important precursor of the malignant process. On this account a number of cirrhosis-producing agents, which are sometimes found in close association with liver cancer, have been credited with carcinogenic properties—liver flukes, schistosomes, highly spiced food, selenium, alcohol—and certain diseases—syphilis, infective hepatitis, haemochromatosis and others. Not one of these agents, however, is common to all the communities known for their high incidence of primary liver cancer.

Faulty diets are perhaps the most important and commonest factors in the production of cirrhosis and other liver damage. A recent survey has indicated that the regions of Africa and Asia which register high frequencies of primary liver cancer are also those with poor nutritional standards; the common defects are insufficiency of animal and other first-class proteins and of certain vitamins of the B complex, with excess of carbohydrates. Chronic malnutrition often manifests itself at an early age as an acute form of kwashiorkor, first reported from the Gold Coast, but since described in different parts of the world under various names. The enlarged fatty liver of this disease may become fibrotic and culminate

in portal cirrhosis; it is these liver lesions that appear to make kwashiorkor such an important factor in the aetiology of primary liver cancer. Similar appearances in the livers of rats can be produced by feeding them on the staple Bantu diet of maize meal and sour milk.

The evidence for aetiology is circumstantial, and the underlying cause for the remarkable sensitivity of the Bantu liver to cancer has not been established; the evolution of cirrhosis from kwashiorkor and the neoplastic transformation perhaps depend on other environmental factors, such as endemic parasitic infection and irritation by known toxic substances acting on a susceptible liver. No naturally occurring carcinogenic substances, analogous to "butter yellow", have been reported thus far in the few enquiries into the dietaries, customs and habits of malnourished populations.

[It is surprising to find no mention in this excellent account of primary liver cancer of KENNAWAY's analysis of mortality statistics [this *Bulletin*, 1945, v. 42, 150) which showed that there is no definite indication of greater liability among the Negroes in the U.S.A. than among the white population, indicating that it must be due to extrinsic factors.]

W. L. Harnett

KEEN, P. **The Bantu and the Aetiology of Cancer.** *South African Med. J.* 1955, Dec. 17, v. 29, No. 51, 1198–9.

The Cancer Research Unit of the South African Institute of Medical Research is making the first scientific statistical survey of the distribution of malignant conditions in a sample urban Bantu population, and in the Radiotherapy Department of the Johannesburg Hospital accurate figures have been kept since 1949, including comparative series in various regions of the body, which have shown suggestive racial differences, indicating possible lines of research. In 1953, in a routine annual survey, it was noted that carcinoma of the paranasal sinuses appeared to be relatively common in the Bantu and a subsequent investigation showed that almost all these cases occurred in heavy snuff-takers; the Bantu of South Africa do not use ordinary tobacco snuff, but add various herbal mixtures which are previously incinerated. Analyses of some of these additives have revealed the presence of anthracene, fluoranthene, 3:4 benzpyrene and 1:12 benzperylene in amounts comparable to those which occur in chimney soot. It has been found that carcinoma of the oesophagus is relatively frequent in the Bantu and that of the stomach correspondingly rare. The bizarre pattern and manifestations of skin cancer in the Bantu should give aetiological clues and the albino should be a source of much useful information. Melanomata in the Bantu, except in the albino, behave like carcinomata with slow lymphatic spread. Kaposi's haemangiosarcoma is mainly cutaneous in its manifestations, and investigation of this condition, so markedly more common in the Bantu, might throw new light on the aetiology of cancer.

During the past 25 years rapid changes in the clinical manifestations of many medical and surgical diseases affecting the Bantu have been noted: diabetes, hyperthyroidism, duodenal ulcer and appendicitis, rare 20 years ago, are now frequently met with, and renal calculi, unknown 20 years ago, are seen occasionally. Environmental factors—diet, smoking and other habits, levelling up of socio-economic conditions—are tending to make aetiological factors more equal, and in another generation the opportunity of studying the clinical racial differences will be lost. The author thinks that the scope of the survey now being carried on must be extended to include various tribal groups and rural areas, and a Central Cancer Institute for non-Europeans should be established, preferably in Johannesburg, but closely associated with the S.A. Institute for Medical Research, the medical school, and the provincial hospitals, to which suitable cases can be sent by the teams undertaking demographic research. The latest tendency in the search for the aetiology of cancer seems to be the study of the host, rather than of the tumour, and for this South Africa presents an ideal opportunity in that most of the manifestations of malignancy in the Bantu are superficial and accessible. New methods of treatment could be tried out, the host studied and the tumour reactions assessed under scientific supervision by a coordinated team working under relatively ideal conditions. *W. L. Harnett*

PARASITOLOGY: GENERAL

Dey, N. C., **Medical Parasitology.**

This book was reviewed on p. 262.

d'Alessandro, G. & Burgio, G. R. Fenomeni immunitari nelle infezioni protozoarie e loro applicazioni diagnostiche (con particolare riguardo ad amebiasi, malaria, leishmaniosi e toxoplasmosi). [**Immunological Phenomena in Protozoal Infections and their Diagnostic Application, with special reference to Amoebiasis, Malaria, Leishmaniasis and Toxoplasmosis**] *Giorn. di Malattie Infettive e Parassit.* 1955, Sept., v. 7, No. 9, 439–504, 6 figs. [Numerous refs.] Discussion 505–10.

In this paper, which was read at the 6th National Congress of the Italian Society for the Study of Infectious and Parasitic Diseases held at the end of 1954, the authors review the present state of knowledge regarding immunity in protozoal diseases and the application of various immunological reactions in the diagnosis of those diseases which are

prevalent in Italy, *viz.* amoebiasis, malaria, visceral and cutaneous leishmaniases, and toxoplasmosis.

Following a general introduction, in which the nature and scope of immunity in protozoal infections are discussed, a detailed account is given of this phenomenon and its diagnostic application in various forms of the 4 diseases mentioned. In each of these the following aspects of immunity are considered: innate and acquired resistance to infection, immunological aspects of the clinical picture and of the course of infection, and finally the practical application of immunological reactions in the diagnosis of the disease in question.

The numerous references listed in the bibliography are classified according to the diseases. *C. A. Hoare*

Jírovec, O. Nové poznatky o pneumocystose kojenců. [**New Facts relating to Pneumocystosis of Infants**] *Československ. Hyg., Epidemiol., Mikrobiol., Imunol.* Prague. 1955, v. 4, No. 8, 389–401, 4 figs. on pl. & 2 text figs. [Numerous refs.] English summary.

Since the discovery of *Pneumocystis carinii* as the causal organism of interstitial plasma cell pneumonia of infants by Vaněk and Jírovec [this *Bulletin*, 1952, v. 49, 908] it has been suggested that the organisms visible in the lungs are actually *Candida pseudotropicalis* or a species of *Saccharomyces* [*ibid.*, 1955, v. 52, 578]; the author has had the opportunity of examining the preparations upon which these statements were based and has been able to establish that the organisms concerned are actually *Pneumocystis carinii*. Claims to have found *Pneumocystis* in organs other than the lungs are based on misinterpretations of histological preparations. The annual number of cases of pneumocystosis recognized at autopsy in Czechoslovakia has risen from 38 in 1951 to 102 in 1954, with a total of 386 cases during the period; infants between 2 and 4 months old were mainly affected, and there was no seasonal variation in incidence. Cases have also been reported from Germany, Austria, France, England, Poland and Italy, but not as yet from the Soviet Union or the United States. *D. J. Bauer*

Hamperl, H. **Pneumocystis Infection and Cytomegaly of the Lungs in the Newborn and Adult.** *Amer. J. Path.* 1956, Jan.–Feb., v. 32, No. 1, 1–13, 11 figs. on 5 pls. [36 refs.]

"In the case of fatal inclusion-disease pneumonitis described by McMillan in 1947, the same parasite (*Pneumocystis carinii*) has been found as is known to cause an interstitial plasmacytic pneumonitis in the newborn in Europe. This pneumonitis in Europe is frequently combined also with cytomegalic disease. Accordingly, as this parasite occurs in North America, one must consider the possibility of an occasional infection of this type in the newborn of that region.

"It seems doubtful that there is in adults a pneumonitis due to cytomegalic infection, since a simultaneous infection with these parasites most probably was present also in the other known cases of cytomegalic pneumonitis (Wyatt *et al.*).

Mackinnon, J. E. & Abbott, P. **A Sudanese Case of Sarcosporidiosis.** *Ann. Trop. Med. & Parasit.* 1955, Oct., v. 49, No. 3, 308–10, 1 fig. on pl.

The authors point out that only 20 cases of human sarcosporidiosis have so far been recorded. To this number they now add another, observed by them in a Sudanese, who was suffering from mycetoma (Madura foot). In sections of two tumours excised from his feet, numerous cysts (about 15 per sq. cm.) were detected in the muscle tissue. They measured up to 60 μ in diameter, were surrounded by a membrane, and contained numerous spores measuring 6–7 μ in length, which were not separated by septa. None of the cysts showed evidence of necrosis, and there was no inflammatory reaction on the part of the host tissues. The appearance of one of these cysts is shown in a photomicrograph.

The cysts in question are regarded as belonging to *Sarcocystis lindemanni*. Like some previous observers, the present authors believe that human sarcosporidiosis is more common than is generally realized, its apparent rareness being due to failure on the part of pathologists to examine muscle tissues and to diagnose this infection. *C. A. Hoare*

Zlotnick, A. **Observations on a Parasite found in Leucocytes of the Peripheral Blood in a Case of Hepato-Splenomegaly.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 472–5. 6 figs. on pl.

The author describes a case of prolonged febrile disorder, accompanied by hepato-splenomegaly and albuminuria, in a patient of Iraqi origin observed in Jerusalem. In the course of about 2 months the patient had 10 febrile attacks which occurred every 4–5 days, suggesting some parasitic infection. On 3 occasions blood was taken for lupus erythematosus cells and in stained smears intracellular bodies were seen lying within vacuoles in leucocytes. They are thought to be a parasitic protozoon of unknown nature, which is oval or rod-shaped, measuring 1–1·5 μ × 4–8 μ, with a central nucleus. From 1 to 8 parasites were seen in the host cells, represented by monocytes and neutrophils. The connexion between this parasite and the condition of the patient has not been ascertained, but it is noted that it resembles the parasite described by Archibald and Susu [this *Bulletin*, 1924, v. 21, 775] from a Sudanese suffering from hepato-splenomegaly. In the present case, an attack was

postponed for several days after treatment with proguanil. Infected leucocytes are depicted in a plate of photomicrographs. *C. A. Hoare*

DE BEI, G. Condizioni igienico-sanitarie nei comuni del Delta Padano. Nota I.—Diffusione delle parassitosi intestinali nella popolazione infantile di Chioggia e Sottomarina. [**Intestinal Parasites in Children in Chioggia and Sottomarina, Italy**] *Igiene e San. Pubblica.* Rome. 1955, Sept.–Oct., v. 11, Nos. 9/10, 495–501.

The English summary appended to the paper is as follows:—

"The frequency of the intestinal infestations among the school children from 6 to 12 years of age in the municipalities of Chioggia and Sottomarina has been investigated. The examination of 426 children, 235 of which of Chioggia and 191 of Sottomarina has shown that the greatest incidence of helminthiasis is given by Trichocephaliasis, Ascaridiasis and Oxyuriasis. These infestations show a frequency rate of 91·62 per cent at Sottomarina and of 31·48 per cent at Chioggia.

"The greatest incidence was always observed by the females.

"Regarding the greater frequency of Sottomarina we should remark the worst hygienic conditions of life of the same center."

GERWEL, C. Zwalczanie pasożytów przewodu pokarmowego człowieka w Polsce. [**The Campaign against Intestinal Parasites of Man in Poland**] *Wiadomości Parazytologiczne.* Warsaw. 1955, v. 1, 53–82, 2 charts. [18 refs.] German summary.

The investigation of intestinal parasites in Poland has been greatly extended in recent years by the activities of a parasitological committee set up in 1952 by the Polish Academy of Sciences, and in the present paper a review is given of work which has been carried out so far. The available methods of investigation have been compared by KASPRZAK and PAWLOWSKI, who examined several thousand stool specimens and concluded that the simultaneous use of the Rivas, Faust and decantation methods will give 94 per cent. of positive results in protozoal and worm infections. In field investigations carried out on 10,027 children aged up to 14 years and living in most parts of Poland 5,800 (58 per cent.) were found to harbour one or more intestinal parasites. In an investigation of mental hospital patients KOZAR and SZYMANSKA found infection in 58·4 per cent. of 1,556 and 79·2 per cent. of 362 patients investigated; *Enterobius vermicularis* was found in 52·2 per cent., *Trichuris trichiura* in 31·7 per cent. and *Ascaris lumbricoides* in 17·8 per cent. GROTT, DZIECIOLOWSKI and KUZMICKI have obtained good results in the treatment of enterobiasis with the berries of *Vaccinium myrtillus* (bilberry); GIERON and NIEMIRSKI consider that pure benzene is a cheap, effective

and non-toxic anthelmintic of general action, and Dadlez, Gerwel and Kaminski find that tin compounds are of value in the treatment of *Taenia saginata* infection. *D. J. Bauer*

Young, C. N. **Parasitic Infection on a Tobacco Farm in the Umvukwes District.** *Central African J. of Med.* 1955, Nov., v. 1, No. 6, 288.

In August 1954 the author examined 80 African labourers on a tobacco farm in Southern Rhodesia. On the whole they appeared to be physically fit, but a few admitted to occasional haematuria or abdominal pain but no diarrhoea.

A single examination of stool and urine showed that 69 had parasitic infections. Of these 45 showed *Schistosoma haematobium* and 18 *S. mansoni* (10 were doubly infected). *E. histolytica* was found in 25 and most of these had schistosomes also. Eleven harboured hookworms.

The men were treated with orthodox remedies appropriate to their infections, their huts were sprayed with BHC and the water supplies treated with copper sulphate.

Six months later, the whole labour force of the farm (79 Africans, of whom 61 had been examined on the previous occasion) were re-examined. It was now found that 45 of the 61 were free from infection, 8 had schistosomes, 7 amoebae and 1 hookworms. Of the 18 new labourers, 11 had one or other of these parasites. The farmer had an impression that the men worked a little better and longer, especially in the heat of the day, since treatment, but he found no outstanding improvement in the amount or quality of the work.

This small survey of a typical rural African population in a European area showed that while parasitic infestation was high, there was little evidence of disease and the men were able to carry out their daily work, presumably because of some immunity to the common parasites.

It is pointed out that eradication of these parasites on a large scale would take many years and only when the standard of positive health was appreciably raised could any material improvement in their working capacity be expected. *H. J. O'D. Burke-Gaffney*

Deschiens, R. Étude comparée des hyperéosinophilies parasitaires et non parasitaires. [**Comparative Study of Parasitic and Non-Parasitic Eosinophilia**] *Rev. Path. Gén. et Comparée.* 1955, Nov., v. 55, No. 672, 1316–35. [Refs. in footnotes.]

The English summary appended to the paper is as follows:—

" Comparative study of hypereosinophilia (parasitic vs non-parasitic) in man and animals (cat, dog, guinea-pig).

" Hypereosinophilia induced by parasites may be differentiated from others, using the 3 following criteria:

" Frequency of response to a given agent

" Shape of the curve of eosinophilia

" Lability, as contrasted to irreductibility, in patients treated with hormones.

" Among parasitic cases:

" 1) Hypereosinophilia is almost always evident, although varying in degree

" 2) Evolution follows the same general curve, with lag period, increase and decrease

" 3) Eosinophilia is generally irreductible in patients treated with hormones.

" Non parasitic cases are much more diversified but usually show:

" 1) Low frequency of response (Streptomycin or red pepper cause eosinophilia in 10 to 40% of treated subject)

" 2) A flattened and irregular curve (with exception for tropical or radium induced eosinophilia)

" 3) Easy remission following treatment with corticotrophic hormone or with cortisone, again with the exception of eosinophilia induced by X-rays or Radium.

" Response to hormonal treatment depends on the severity of intoxication by the causal agent: in the guinea-pig, experimental intoxication by extracts from *Fasciola hepatica* induces congestive and degenerative changes in the glandular cells of the adrenals, whereas after injection of streptomycin, or of red pepper, anatomo-histo-pathological responses are limited to juxtamedullary congestion and hyperplasia in the reticulated area.

" The hematological syndrome of eosinophilia thus appears to be correlated with troubles affecting the adrenals."

Lavier, G. Les éosinophilies parasitaires. [**Parasitic Eosinophilia**] *Rev. Path. Gén. et Comparée.* 1955, Nov., v. 55, No. 672, 1280–95, 3 figs. [Refs. in footnotes.]

The English summary appended to the paper is as follows:—

" Following infestation by Helminths, the patient shows, after a lag period, an initial rapid increase of eosinophiles; the increase slows down and is followed by a gradual decrease, resulting in a dyssymmetric bell-curve.

" The shape of the curve depends on the species of Helminth; as the number of parasites increases, the effect of the peak of the curve itself increases within limits; there is a certain load which exerts maximal effect; as that load is exceeded the effect is less and less evident or even may be abolished (paradoxical Schilling's phenomena).

" Specific drugs induce an initial abrupt increase of eosinophiles, followed by a decrease which is much more rapid than is observed in the absence of medication.

" Following spontaneous recovery from a first infestation, a new infestation causes only an attenuated eosinophilia, suggesting that the parasites excrete some substance which tends to induce immunity."

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Jensen, D. V. **Methods for Dissecting Salivary Glands in Mosquito Larvae and Pupae.** *Mosquito News.* 1955, Dec., v. 15, No. 4, 215–17, 5 figs. on pl.

Mariani, M. & Boscarino, A. Sulla presenza di *A. marteri* Senevet e Prunelle (1927) in Sicilia. [**Presence of** *Anopheles marteri* **in Sicily**] *Riv. di Malariologia.* 1955, Dec., v. 34, Nos. 4/6, 227–30, 3 figs.

The English summary appended to the paper is as follows:—

" The authors report the presence in Sicily of *Anopheles* (*Anopheles*) *marteri* Senevet and Prun., a mosquito already recorded from Algeria, Sardinia and Corsica. It was found in mountainous places characteristic of the provinces of Ragusa, Siracusa and Palermo. The authors believe, that the distribution of this *Anopheles* might have a wider range than ascertained up to now. *A. marteri* is added to the five anopheline species already identified in Sicily: *A. claviger*, *A. labranchiae*, *A. algeriensis*, *M. hispaniola*, *M. superpictus*."

Thurman, D. C., Jr. & Thurman, Ernestine B. **Report of the Initial Operation of a Mosquito Light Trap in Northern Thailand.** *Mosquito News.* 1955, Dec., v. 15, No. 4, 218–24, 3 figs. [11 refs.]

A New Jersey light trap was tried in Thailand from March 1952 to April 1953. Over 28,000 mosquitoes were taken in 282 trapping nights and these included 11 of 18 genera and 66 of about 200 species on the island. Some new records were obtained. *Culex* spp. comprised 78 per cent. of the catch, and *Anopheles* spp., 18 per cent. *A. minimus* was not taken in the trap but there seems doubt about its earlier elimination from the area by DDT sprayings. *A. vagus*, *A. philippinensis*, *A. aconitus*, *A. nigerrimus*, and *A. sinensis* were caught by the trap and, notably abundant among culicines, were *C. tritaeniorhynchus*, the *Culex pipiens* group, and *C. gelidus*, vectors of Japanese B encephalitis.

Species of *Aëdes*, *Armigeres*, and *Mansonioides* also occurred. Mosquitoes increased with the rains (June to August) with a decline during floods (September). In the dry-cold season (November to January) anopheline density again increased at first and then declined, whereas culicine abundance declined progressively. *D. S. Bertram*

Carpenter, S. J. & LaCasse, W. J., **Mosquitoes of North America (North of Mexico).**

This book was reviewed on p. 261.

Twinn, C. R. **Review of Recent Progress in Mosquito Studies in Canada.** *Mosquito News.* 1955, Dec., v. 15, No. 4, 195–203. [Numerous refs.]

"Progress in studies on mosquitoes in a biting-fly research program in Canada is reviewed and references are given to recently published and some unpublished work. The subjects dealt with include systematics and distribution of Canadian species; attempts to rear laboratory colonies of northern species of *Aedes*; relation of the immature stages to their environment; behavior of adult mosquitoes in relation to meteorological conditions; their dispersal and flight range; food of the adults; responses of *Aedes* females to various factors relating to their hosts; biological and chemical control, and repellents."

Craig, G. B., Jr. **Preparation of the Chorion of Eggs of Aedine Mosquitoes for Microscopy.** *Mosquito News.* 1955, Dec., v. 15, No. 4, 228–31, 4 figs. on pl. [11 refs.]

Beckel, W. E. **Oviposition Site Preference of *Aedes* Mosquitoes (Culicidae) in the Laboratory.** *Mosquito News.* 1955, Dec., v. 15, No. 4, 224–8.

Some simple laboratory observations on oviposition by *Aëdes hexodontus*, *A. aegypti*, and *A. campestris*, indicate that the first two species may in nature prefer rough dark substrates to lighter ones; *A. campestris* may prefer open water to merely moist sites. *D. S. Bertram*

Wharton, R. H. **The Susceptibility of Various Species of Mosquitos to DDT, Dieldrin and BHC.** *Bull. Entom. Res.* 1955, Aug., v. 46, Pt. 2, 301–9. [15 refs.]

The susceptibility of adults and larvae of several species of mosquitoes to DDT, BHC and dieldrin was examined in laboratory tests. The

methods are fully described. Analysis by probit methods was used to determine median lethal concentrations (MLC), the values given below being the percentage concentration of insecticide (adults) and parts per million in water (larvae).

Laboratory colonies tested were *Aëdes aegypti*, *Aëdes albopictus*, *Culex pipiens fatigans*, *C. p. molestus*, *Anopheles maculipennis atroparvus*, and *A. quadrimaculatus*; wild-caught females of *A. maculatus*, *Culex gelidus*, *Mansonia longipalpis* and *M. uniformis* were also tested. Some of the work was done in a London laboratory, the rest in Malaya.

The substance of the results is well set out in the author's summary:

" Adult mosquitos tested in London showed no striking differences in susceptibility to DDT, though the median lethal concentration (MLC) of *Culex pipiens molestus* Forsk. (1·6 per cent.) was greater than the MLC of *Aedes aegypti* (L.) (0·9), *Anopheles maculipennis* var. *atroparvus* van Thiel (1·0), or *A. quadrimaculatus* Say (0·7). *C. p. molestus* and *Aë. aegypti* showed the same order of susceptibility to dieldrin and BHC, with *Anopheles m. atroparvus* more susceptible to both insecticides.

" Adult and larval mosquitos in Malaya varied considerably in their susceptibilities to DDT, dieldrin and BHC. Adult *Culex pipiens fatigans* Wied. showed a low degree of susceptibility to DDT (MLC $>$ 5·0) and other species showed varying degrees of susceptibility, *Aë. aegypti* (1·6), *Anopheles albopictus* (Skuse) (1·3), *Mansonia longipalpis* (Wulp) (0·8), *M. uniformis* (Theo.) (0·5), *C. gelidus* Theo. (0·3 to 0·5) and *Anopheles maculatus* Theo. (0·4). *C. p. fatigans* (0·46) was readily killed by dieldrin, but was less susceptible than *Aë. albopictus* (0·23), *C. gelidus* (0·18), *M. longipalpis* (0·14), *Aë. aegypti* (0·13) or *M. uniformis* (0·12). Larvae of *C. p. fatigans* (MLC 0·145 parts per million) were also less susceptible to DDT than *Aë. aegypti* (0·008), *Aë. albopictus* (0·065), or *Anopheles maculatus* (0·026); but were more easily killed by dieldrin and BHC than the other species.

" Under the conditions of these experiments BHC was apparently the most toxic material to adults because of its fumigant properties. Dieldrin was found to be more toxic than DDT to the adults of all species. Dieldrin was the most effective material against larvae; it was more toxic than BHC to all species and more toxic than DDT to all except *Aë. aegypti*. DDT was more toxic than BHC to the larvae of all species except *C. p. fatigans*.

" It is suggested that, where possible, a median lethal concentration should be determined for the main vector mosquitos wherever residual insecticides are used, to serve as a basis for comparison when resistance is suspected."

C. p. fatigans proved extremely insusceptible to DDT, which confirms field experience in Malaya [this *Bulletin*, 1951, v. 48, 1076], British Guiana [*ibid.*, 1949, v. 46, 183], and Kenya [*ibid.*, 1953, v. 50, 190]. This characteristic is innate and not an acquired resistance to DDT.

D. S. Bertram

Rajindar Pal, Sharma, M. I. D. & Krishnamurthy, B. S. **Preliminary Observations on the Use of Dieldrin to control breeding of Culicine Mosquitoes.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1955, Sept., v. 3, No. 5, 165–9.

Dieldrex, a 15 per cent. emulsifiable concentrate of dieldrin, was used for the application of dieldrin at 0·25 to 2·0 oz. per acre of water to stagnant pools, with and without sullage, and running water in sullage drains in which culicine mosquitoes bred. In the absence of scum or vegetation in stagnant pools breeding was negligible for 15 days after treatment. Vegetation or scum reduced effective control to 4 or 5 days; with running water good effect lasted only hours. Spraying the vegetation along the edges of sullage drains with 25 mgm. per sq. ft. dieldrin, 20 mgm. per sq. ft. gamma BHC, or 100 mgm. per sq. ft. DDT is reported to give encouraging kills of adult mosquitoes for about 10 days after a single application. [The mosquito species concerned in these preliminary tests are not named.] *D. S. Bertram*

Dowling, M. A. C. **An Experiment in Mosquito Control using Dieldrin dispersed as a Dry Fog.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 590–601, 5 figs. & 2 graphs.

A portable fog generator, Swingfog, which can be operated by one man, was used on the island of Blakang Mati adjacent to Singapore in a pilot experiment against culicines, including *Aëdes albopictus*, breeding in inaccessible places. Dieldrex 15, an emulsion concentrate of 15 per cent. dieldrin, was used. The whole island of 4½ square miles was treated during a week with 5 fog generators. Fogging outdoors was done between 6.30 and 9 00 a.m. and thorough fogging indoors afterwards in military barracks, Chinese and Malay villages. The estimated dosage outdoors was 6 mgm. per square metre and the cost was 1s. 3d. per acre.

Pretreatment catches of mosquitoes were mainly of *Culex fatigans*, *A. albopictus*, *C. siamensis*, *C. gelidus*, and *A. butleri* in that order of abundance. *A. albopictus* was greatly reduced but began to increase rapidly in the 3rd week after fogging. Other species were more effectively controlled and, including *C. fatigans*, had not become a biting nuisance again 9 weeks after fogging.

The high pretreatment catches were made despite considerable routine control of mosquito breeding. These measures were stopped when the fogging was instituted and the good results are due to fogging alone.

In the discussion of this paper and in a considerable addendum to it, the author sets out the nature of some further experiments in progress or proposed, and comments on the sort of information he hopes to obtain to improve the technique of fogging and to define if and when it may be applied against several kinds of medically important arthropods in Malaya. The general conclusion so far is that fogging should be combined with residual spraying and species sanitation of standard

practice. The Swingfog SN6 is a new model and is better than the original type used in the pilot experiment. *D. S. Bertram*

Gahan, J. B. & Noe, J. R. **Control of Mosquito Larvae in Rice Fields with Water-Soluble Phosphorus Insecticides.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 665–7.

"A study was conducted to evaluate the effectiveness of water-soluble larvicides for the control of mosquitoes in Arkansas rice fields. All treatments were applied with an automatic applicator to the irrigation water before it entered the fields.

"Against floodwater *Psorophora* solubilized parathion was completely effective at 0·01 p.p.m. after a flow of more than ½ mile through a canal and 400 feet through a rice field. A high degree of control also occurred in plots treated at 0·005 p.p.m., but some live larvae were found. Bayer L 13/59 and Shell OS 2046 gave 100 per cent control at 0·25 or 0·5 p.p.m., and DDVP was highly effective at 0·05 and 0·1 p.p.m. This species was controlled in large fields after the chemically treated water had travelled more than a mile in a canal and 2,500 feet through the rice.

"None of the treatments had sufficient residual toxicity to be effective against *Anopheles quadrimaculatus* Say or *Culex erraticus* D. and K. 1 week after treatment."

See also p. 657, Bakry, **Preliminary Investigations of the Seasonal Incidence of *Musca sorbens* Wied. in relation to Acute Ophthalmias in Egypt.**

Standifer, L. N. **Larvicides for Control of the House Fly.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 731–3.

Mitlin, N. & Babers, F. H. **Relative Toxicity of topically applied Allethrin and Pyrethrins to House Flies and Cockroaches.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 747–8.

Tahori, A. S. **Diaryl-Trifluoromethyl-Carbinols as Synergists for DDT against DDT-Resistant House Flies.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 638–42. [11 refs.]

"Twenty-nine compounds structurally related to DDT were tested as DDT synergists against a slightly and a moderately resistant strain of house flies. Bis-(p-chlorophenyl)-trifluoromethyl-carbinol was found to be the most active synergist among the compounds tested.

"The activity is reduced by replacement of the chlorine atoms by other halogens, alkyl, nitro and alkoxy radicals, by reduction of the carbinol to

the corresponding ethane, by its esterification, by a prolongation of the aliphatic chain, or by elimination of one p-chlorophenyl group.

"In the residual test, bis-(p-chlorophenyl)-trifluoromethyl-carbinol extended the residual effect of DDT considerably and proved to possess at least as good a synergistic effect as the best synergists reported so far."

Frontali, Nora. Attività della colinesterasi in ceppi sensibili e in ceppi resistenti al DDT di *Musca domestica* L. [**Cholinesterase Activity in Strains of *Musca domestica* Sensitive and Resistant to DDT**] *Riv. di Parassit.* Rome. 1955, Oct., v. 16, No. 4, 241–52. [24 refs.] English summary (8 lines).

In the early days of investigations on the mode of action of DDT, it was considered possible that this insecticide inhibited cholinesterase. No direct evidence for this was obtained, though insects treated with DDT were found to contain larger quantities of acetylcholine than normal. Babers and Pratt [this *Bulletin*, 1952, v. 49, 1004] produced some evidence that DDT-resistant strains of house-flies had lower cholinesterase content than normal flies for a few days after emergence; in later work they found such big differences within strains that the difference between the two types seemed dubious.

The author points out that DDT-resistant strains vary in type, some being resistant to knock-down by DDT, others to kill only. Possibly, then, the physiological mechanisms involved differ. Accordingly, several resistant strains of different types from different sources were used in an investigation of cholinesterase activity and DDT resistance. However, the results indicated (i) no effect of DDT *in vitro* on cholinesterase from any strain of fly, (ii) no relation between resistance and enzyme activity in the various strains, (iii) the progeny of crosses between various strains showed no significant departure from the cholinesterase activity of their parents. *J. R. Busvine*

Busvine, J. R. & Khan, N. H. **Inheritance of BHC-Resistance in the Housefly.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 455–9, 1 fig.

Inheritance of BHC-resistance in the house-fly (*Musca domestica domestica*) was studied by crosses and reciprocal crosses of a Uruguay strain which had developed resistance with field use of BHC and a normal strain reared for years in the laboratory. Tests for resistance were made on F_1 and F_2 adults, and compared with results for the parent stocks. The findings are fully presented in graphs and tables. The resistant strain was 100 times more tolerant of BHC than the normal, susceptible strain. The F_1 generation was intermediate in resistance between the the parents. The F_2 generation was again intermediate but at a lower level than the F_1 generation. This and other details of these results

indicate generally that BHC-resistance is associated with multiple gene inheritance. *D. S. Bertram*

Levinson, Z. H. **Chemicals affecting the Preimaginal Stages of the Housefly. V. Vapour Toxicity of the Dichlorobenzenes to Housefly Pupae.** *Riv. di Parassit.* Rome. 1955, Oct., v. 16, No. 4, 253–6, 1 fig. English summary (2 lines).

Dichlorobenzenes have been used to control fly larvae and other maggots (*e.g.*, in pit latrines: see McDuffie *et al.* [*Bull. Hyg.*, 1947, v. 22, 463]. This use may become more important in view of the resistance of house-flies to DDT, chlordane, etc. The authors tested the 3 forms of dichlorobenzene at saturation concentration and found the following percentage survivals from house-fly pupae exposed at 30°C. for 3 hours: *para* 46; *meta* 15; *ortho* 2. Ten hours' exposure to any of the isomers killed all pupae. *J. R. Busvine*

Keller, J. C. & Wilson, H. G. **Granular Baits for the Control of House Flies.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 642–3.

"In tests against house flies, *Musca domestica* L., on garbage and trash piles in a substandard section of Orlando, Fla., cornmeal bait containing 2 per cent of malathion and 10 per cent of granulated sugar gave satisfactory control after one treatment and excellent control was maintained with daily applications during a 4-day test period. Similar bait containing 1 per cent of Diazinon gave excellent control 10 minutes and 4 hours after the second treatment but five treatments were necessary to give satisfactory reductions after 24 hours.

"In unscreened dairy barns baits containing 2 per cent each of malathion and peanut oil and 10 per cent of powdered sugar on carriers of sand or cornmeal or mixtures of the two were highly effective, and about equal to bait containing 2 per cent of Chlorthion and 10 per cent of powdered sugar on sand. Bait containing 1 per cent of Chlorthion and 10 per cent of honey on cornmeal was less effective."

Gersdorff, W. A., Piquett, P. G. & Nelson, R. H. **The Relative Toxicity to House Flies of Pirazinon, Am. Cyanamid 4124, and Malathion in Comparison with Parathion and Pyrethrins.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 680–81.

"The relative toxicities to house flies, *Musca domestica* L., of the organic phosphorus compounds Pirazinon, Am. Cyanamid 4124, and malathion in comparison with parathion and pyrethrins were determined by the Campbell turntable method. The three compounds were, respectively, 0·36, 0·60, and 0·062 as toxic as parathion and 12, 20, and 2 times as toxic as pyrethrins.

"At the concentrations used these phosphorus compounds caused no, or negligible, knockdown of flies in 25 minutes.

"Two conclusions were made with respect to the relationship of chemical structure and toxicity: The substitution of the isopropyl group (forming Diazinon) for the *n*-propyl group in the Pirazinon molecule increases the toxicity by about 33 per cent, and the substitution of hydrogen (forming methyl parathion) for the chlorine atom in the Am. Cyanamid 4124 molecule increases the toxicity by about 13 per cent."

Filipponi, A. Sulla natura dell'associazione tra *Macrocheles muscaedomesticae* e *Musca domestica*. [**Nature of the Association between** *Macrocheles muscadomestica* **and** *Musca domestica*] *Rendiconti Istituto Superiore di Sanità*. Rome. 1955, v. 18, Pt. 11, 1129–52, 2 figs. English summary.

Macrocheles muscadomestica is a mite of the house-fly, *Musca domestica*, found in horse-dung (and other breeding materials); the female mites also become attached to the adult flies. Both adult and immature mites attack all stages except the puparia of the house-fly, the mites seeking out their prey. Eggs and first-stage larvae are destroyed in greater numbers than the more active, tougher large larvae. Attachment of the female mites to adult flies is simply a matter of their gripping a hair or a fold of integument with their chelicerae, and the flies do not suffer any ill-effects even if attachment lasts for 15 days. The mean period of attachment was 7 days. On the other hand, attached mites do not live as long as fasting mites. *D. S. Bertram*

Kano, R. & Okazaki, T. **Notes on the Flies of Medical Importance in Japan. Part IX. Revision of the Genus** *Calliphora* **in Japan, with a Redescription of** *Calliphora lata* **Coquillett, 1898.** *Bull. Tokyo Med. & Dental Univ.* 1955, Sept., v. 2, No. 2, 103–11, 4 figs. (1 coloured). [21 refs.]

James, M. T. **The Blowflies of California (Diptera: Calliphoridae).** *Bull. California Insect Survey.* 1955, v. 4, No. 1, 1–34, 1 text fig. & 7 figs. on 2 pls.

Lipparoni, E. Presenza del *Simulium damnosum* nella zona del medio Uebi Scebeli. [**Presence of** *Simulium damnosum* **in an Area of the Middle Uebi Scebeli Region, Somaliland**] *Riv. di Parassit.* Rome. 1955, Oct., v. 16, No. 4, 231–6. English summary (8 lines).

The English summary appended to the paper is as follows:—

"As confirmed by a recent survey, the territory of Somaliland is free of onchocercosis. The author points out to the circumstances which have

led him to carry out a survey in the region of the Middle Uebi Scebeli on *S. damnosum*, main vector of the disease in Africa. The author describes the local ecological conditions and brings forward some epidemiological considerations derived from such a survey. While the density of the vector's population is not high, its anthropophilic and zoophilic activities seem to be conserved. The author suggests more extensive surveys and an accurate vigilance."

Enigk, K. Zur Biologie und Bekämpfung der Kriebelmücken. [**Biology and Control of** *Simulium*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Oct., v. 6, No. 3, 368–74. [Numerous refs.]

This is a short survey of the literature on the biology and control of *Simulium*. The author has shown that *S. ornatum* and *S. argyreatum* larvae survive in water with an oxygen content of 65 per cent., but that in a slow water current of 20 cm./sec. the larvae thrive only if the water is rich in suspended organic material. He suggests that contamination of rivers and streams favours the spread of *Simulium*. In Germany the most efficient method of control appears to be spraying with 0·1 per cent. contact insecticide (DDT, toxaphene, dieldrin) trees and bushes along the stream, on which adults rest, in an area 100 metres on either side of the stream, every 10 days from mid-April to mid-September.

B. R. Laurence

Cole, M. M. **Resistance to Ovicides by Eggs of the Body Louse.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 764–5. [10 refs.]

Davis, G. E. & Mavros, A. J. **Observations on the Biology of** *Ornithodoros d. delanoëi* **Roubaud and Colas-Belcour, 1931 (Ixodoidea, Argasidae).** *Bull. Soc. Path. Exot.* 1955, v. 48, No. 5, 698–704.

Hoogstraal, H. *Ornithodoros d. delanoëi* **Roubaud and Colas-Belcour 1931 (Ixodoidea, Argasidae); its Identification and Distribution, Incidence and Habitats in Egypt.** *Bull. Soc. Path. Exot.* 1955, v. 48, No. 5, 734–47, 1 map & 4 figs. on 2 pls.

McDuffie, W. C. & Smith, C. N. **Recommended Current Treatments for Tick Control.** *Pub. Health Rep.* Wash. 1955, Mar., v. 70, No. 3, 327–30.

Transmission of diseases (Rocky Mountain spotted fever, tularaemia, Bullis fever, and relapsing fever) by ticks in America and the discomfort of their bites call for control measures and individual protection.

Methods now available are reviewed. Control of hard ticks in pastures and the like is effected by applications as sprays or dusts of one of the several chlorinated hydrocarbons. DDT at 1 to 2 lb. per acre is effective in a few days with residual control for at least a month; gamma BHC at 0·1 lb. per acre is successful in hours and at 0·5 lb. per acre persists so for several weeks. Ground appliances and aerial distribution are briefly outlined. Treatment should begin in early spring with a final application by early summer.

To destroy hard ticks brought indoors on dogs, residual sprays are applied to floors and walls. Preference is, however, for hygienic standards to prevent established infestations indoors.

Personal protection is based on impregnation of clothing. Dimethyl phthalate or 2-ethyl-1, 3-hexanediol give 75 per cent. protection. Better repellents are Indalone, but it is not widely available, and *N*-butylacetanilide, *N*-propylacetanilide, undecylenic acid, and hexyl mandelate, but they are used only under supervision, as in the Services, and are not suitable for unrestricted civilian use. Details are given of methods of impregnation. *D. S. Bertram*

Asahina, S. **A Tentative List of Japanese Cockroaches (Blattaria).** *Japanese J. Med. Sci. & Biol.* 1955, Apr., v. 8, No. 2, 199–205. [26 refs.]

Barlow, F. & Hadaway, A. B. **Studies on Aqueous Suspensions of Insecticides. Part V. The Sorption of Insecticides by Soils.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 547–59. [12 refs.]

A previous paper [this *Bulletin*, 1953, v. 50, 165] reports that particles of insecticide in aqueous suspension are absorbed into mud blocks made of certain tropical soils. DDT and dieldrin, which are non-fumigant, are rendered ineffective as insecticides but gamma BHC and aldrin with their fumigant property continue to exert an insecticidal action. Sorption into a mud block is now shown to be a process in which molecules of the insecticide in the vapour phase pass into the block, mainly from the surface of the insecticide particle in contact with it. Experimental substrates were tested and one including iron oxide, which is contained in laterite soils in high proportion, was extremely adsorptive. Crystals of less than 10 to 30 μ of DDT, gamma BHC, and aldrin were completely adsorbed in 2 hours, 1 hour, and 10 minutes, respectively. Adsorption is followed by diffusion deeper into the mud block and, although the more volatile insecticides tend to desorb out through the surface rather than diffuse more deeply, it is shown with DDT that it slowly diffuses deeper into the block until it may be as deep in the mud as 1·2 cm. a year after application. In time, more DDT lies at deeper levels than superficially

and this seems to the authors to be an explanation for the small amounts of DDT in superficial scrapings of mud walls in some field assays. There is little evidence in the present work to support decomposition of DDT in mud. If analysis is made throughout a sufficient depth of mud, the recovery of DDT is comparable to the original deposit even 12 months after application.

A test for sorptive properties of soils is described and, although admittedly having limitations, gave interesting results in a comparison of standardized mud blocks made from soils of Uganda, Kenya, Nigeria, Liberia, Jamaica, Mexico and the British Isles. Under precisely controlled conditions the weight of carbon tetrachloride taken up by a block in 24 hours was compared with the time taken for DDT particles of 0–10 μ at 100 mgm. per square foot to disappear from the surface of a corresponding block of soil made with water. A Uganda red soil block took up 25 per cent. of its weight of carbon tetrachloride and DDT crystals had disappeared by adsorption in 3 days. Mexican brown soil and all but one of the British Isles samples sorbed from 2 to 9 per cent. carbon tetrachloride, and DDT crystal deposits showed no change in 3 months. On the whole the actively sorbent soils were tropical laterite ones, generally red in colour. But exceptions were found: grey soil from Taveta, Kenya, was among the most sorptive for DDT and carbon tetrachloride. Conversely, red Taveta soil was somewhat intermediate in these characteristics even although it contained a high iron oxide content. These results go some way to explaining the absence of sorption of insecticides reported in work at Taveta [*ibid.*, 1953, v. 50, 1011]. It is emphasized that red colour and iron oxide content do not necessarily indicate a soil unsatisfactory as housing blocks when residual deposits of insecticides are intended, although in the present work it has proved so in 3 kinds of red lateritic soil out of 4 tested. For experimental convenience the sprays of DDT dispersible powder were controlled to give the small particle stated; the larger particles, and heavier dosages, in field usage would give longer residual effects.

Prevention of sorption was investigated, it being borne in mind that some degree of adsorption gives better insecticidal action from a surface than if it were quite non-adsorbent. Uganda soil mixed with 25 to 50 per cent. sand remained, in blocks, as adsorptive as the unmodified soil blocks. Pre-treatment of blocks with 2 per cent. solution of size in water was essentially unsuccessful in that, although adsorption was prevented, the availability of the DDT particles was reduced. Crystals did not detach readily on to test insects (*Aëdes aegypti*) of which only 88 and 76 per cent. died 24 hours after 8 minutes' contact with the sized, sprayed, surface: the first result occurred the same day as spraying, the second 2 weeks later. No evidence was obtained that pretreatment with phosphatic solutions or other chemical interchange with oxides of the soils was helpful in preventing loss of insecticidal action of dispersible DDT powders. Coatings on mud blocks (of Uganda soil as in all these tests)

of urea-formaldehyde resins with 10 per cent. DDT content (also some tests with 5 per cent. dieldrin content) showed that loss of insecticidal activity still took place. At first, resin solvents and insecticide were sorbed at application followed by a slower sorption of insecticide into the mud from the set resin coating. The sorbed DDT showed, after 7 weeks, a gradient to a depth of about 6 or 7 mm. into the mud block. Lime-washing [*ibid.*, 1954, v. 51, 231] seems the only practical proposition so far.

In final discussion, the authors emphasize their conclusion that loss of insecticidal action on mud surfaces is due to the physical mechanism of adsorption; decomposition in the mud [*ibid.*, 1952, v. 49, 204; 1954, v. 51, 231; 1954, v. 51, 232] seems unlikely, certainly in mud walls under natural conditions. The arguments are carefully set out.

D. S. Bertram

Bami, H. L. **Testing of 75 per cent DDT Water Dispersible Powder and Possible Causes and Cure for the Defective Materials.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1955, Sept., v. 3, No. 5, 161–4.

In 1954 and 1955, India imported about 125,000 tons of 75 per cent. DDT wettable powder, mainly from U.S.A. Each year, some 700–800 samples were withdrawn and tested for quantity and quality of DDT, particle size, wettability and suspendability. Almost all the tests were satisfactory except that about 5 per cent. of the samples did not pass the test for suspendability, possibly because insufficient suspending agent had been added by the manufacturers. After correspondence with the U.S. Public Health Technical Development Laboratories, it was found that the suspendability of the powder could be rendered satisfactory by making the suspensions (2·5 per cent.) in water to which 1 per cent. liquid wetting agent had been added. Suitable agents were Triton X-100, Antrox or Antara 2332-B.

J. R. Busvine

Srinivasan, R. & Dorai Rajah, K. A. **Effect of Benzene Hexachloride on Fish Life.** *Indian J. Malariology.* 1955, Sept., v. 9, No. 3, 203–5.

The authors briefly review the literature on the effect on fish life of such insecticides as toxaphene, BHC, DDT and aldrin. It is apparent that fish are harmed only when large concentrations of insecticides are used in controlling the mosquito larvae. During the year 1954, the authors studied the effect of BHC 50 per cent. water dispersible powder on fish life in 5 fish farm ponds at Bhavanisagar, India. The ponds contained *Anopheles culicifacies*. The insecticide was applied along the marginal 3 feet of the ponds at the rate of 1 oz. of a suspension of 2 oz.

of powder per gallon of water, per square yard (this gave a concentration of 0·015 p.p.m.). There was 100 per cent. kill of the mosquito larvae but none of the fish were affected.

A series of laboratory tests were made to determine whether BHC 50 per cent. (gamma BHC 6·5 per cent.) could be toxic to fish, and if so what the lethal limits were. The test fish was the Orange chromide (*Etroplus maculatus*). These were subjected to different concentrations of BHC and their behaviour was studied. The authors found that there was a correlation between the rate of kill of fish and the concentration, *viz.* the fish died in 51 hours in 36 p.p.m. concentration of insecticide (2·34 p.p.m. gamma BHC), in 102 hours in 18 p.p.m. (1·17 p.p.m. gamma BHC) and in 118 hours in 12 p.p.m. (0·78 p.p.m. gamma BHC). Concentrations of 6 p.p.m. (0·39 p.p.m. gamma BHC) and lower were not lethal.

The authors conclude that BHC 50 per cent. water dispersible powder at the concentrations normally used for larvicidal work is not lethal to fish. However, since the insecticide is lethal above 6 p.p.m., care must be taken when treating very shallow ponds not to exceed this concentration. *W. Z. Coker*

Davidow, B. & Laug, E. P. **A Surface Aliquot masking Technique for the Bioassay of Lindane.** *J. Econom. Entom.* 1955, Dec., v. 48, No. 6, 659–61, 1 fig.

Fluno, J. A. **Insecticidal Phosphorus Compounds.** *Soap.* New York. 1955, Nov., v. 31, No. 11, 151–4, 203.

This article brings together results on the effectiveness of organic phosphorus compounds on a number of medically important insects. The following related compounds, and some homologues, were tested: Bayer L 13/59 (dimethyl 2,2,2-trichloro-1-hydroxyethylphosphonate), DDVP (dimethyl 2,2-dichlorovinyl phosphate), and Shell OS 1836 (diethyl 2-chlorovinyl phosphate). In laboratory tests with *Anopheles quadrimaculatus* the diethyl homologue of DDVP was effective at 0·025 p.p.m., DDVP at 0·05 p.p.m. and Bayer L 13/59 and Shell OS 1836 at 0·1 p.p.m. Saturated water solutions of Bayer L 13/59 and DDVP were effective at dilutions of 1 in 250,000 and 1 in 100,000 respectively. Effectiveness means at least 94 per cent. kill of larvae after at most 48 hours' exposure to water treated at the dosage given.

For lice, the insecticides were impregnated on to woollen patches by dipping in 1 per cent. solutions and drying before allowing contact of 5 lice of each sex for 24 hours. So long as lice were killed, the patches were repeatedly tested. DDVP and its homologues immobilized all lice at the first test within one hour; DDVP was effective for 10 to 14 days

and the dibutyl homologue for 31 days. Bayer L 13/59, Shell OS 1836, and some homologues were effective also for this period.

For house-flies, several types of test were made. In one, the flies were subject to a spray of the insecticide in kerosene, varying from 0·025 to 2 per cent. concentrations of the insecticide. DDVP, its diethyl homologue, and OS 1836 were equally effective in knock-down and kill (80 per cent. of the flies knocked down in 30 minutes or dead in 24 hours with 0·1 per cent. spray; 100 per cent. success with 0·25 per cent. spray). With Bayer L 13/59 knock-down and kill at 0·25 per cent. concentration, and in these same time intervals, were only, respectively, 3 and 8 per cent. A second form of test assessed the effect of the insecticides in sugar baits. The baits were covered so that flies could feed but not stand on them. Fly mortality was recorded after 24 hours' freedom to feed on a treated bait. Complete mortality followed from 0·01 per cent. DDVP, 0·1 per cent. of the diethyl homologue of DDVP and Bayer L 13/59, and 1·0 per cent. OS 1836 and the dipropyl and diethyl homologues of DDVP and L 13/59, respectively. In a further test of a more natural kind, 1 per cent. of insecticide in granulated sugar was sprinkled on the floor of dairy barns. DDVP and its homologues gave 73 to 99 per cent. reduction within 10 minutes and up to 24 hours' of observation and L 13/59, although slower to affect the fly density, was as effective as the DDVP group after 4 hours. As residual sprays on varnished and unvarnished plywood at 25 to 100 mgm. per square foot DDVP was superior to L 13/59. Even so, it required a long exposure to contact in each case to give 100 per cent. kill 7 to 14 days after the deposit was laid down (1½ hours on a 7-day-old deposit of L 13/59 and 1 hour on a 14-day-old deposit of DDVP). Toxicity and residual action was not apparently influenced by the varnish coat. In residual spraying of barns at 100 mgm. DDVP per square foot the results were not promising. Despite 78 to 100 per cent. reduction in the first 3 days, no effect was apparent at the end of a week.

Panels treated with 200 mgm. insecticide per square foot were allowed to age for 1 day and 1 month. Their insecticidal effects, with L 13/59, DDVP, OS 1836, and an acetate of L 13/59, on fleas and bed bugs after two hours' contact were completely satisfactory in the early tests. After the treated panels were a month old, L 13/59 still killed all fleas and bugs within 24 hours of the two-hour contact, and its acetate and DDVP killed 90 per cent. of the bugs and 70–80 per cent. of the fleas. Shell OS 1836 appeared, from the table given, to be quite ineffective after a month.

D. S. Bertram

MISCELLANEOUS PAPERS

MacArthur, W. **An Account of some of Sir David Bruce's Researches, based on his own Manuscript Notes.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 404–12, 6 coloured figs. on 3 pls.

The year 1955 was the centenary year of the birth of Bruce, and to mark the occasion the Royal Society of Tropical Medicine and Hygiene invited Sir William MacArthur to address a meeting on an appropriate subject. The speaker avoided the well known accounts of Bruce's work, and did his own research on the manuscript notes which record Bruce's early work on Malta fever and nagana. The picture emerges of a dogged and sceptical investigator, who would not be content with less than proof. He was, unfortunately, not able to complete the enquiry into Malta fever by finding the origin of the infection, and he did not discover the fact that tsetse flies, after being infective shortly after a bite on an infected animal, again become infective after a period during which cyclical development of *Trypanosoma brucci* takes place, but he did discover the organism of Malta fever and that of nagana, and he did recognize that *T. brucci* was transmitted by tsetse; he was the first to prove that a biting insect could transmit a protozoan parasite.

The author makes reference to the help which Bruce received from Lady Bruce throughout this arduous work, and has reproduced in colour some of her drawings, with Bruce's notes on them. The story is full of interest, and is not clogged with too much detail. It is enlivened for one reader by a few tilts typical of the author—on the non-authenticity of the story of Robert the Bruce and the spider, and on the misuse of the word "sacrifice" in relation to experiments on animals—and by felicity of language with hints of the Bible and of the epilogue to *Asolando*.

Charles Wilcocks

Kenney, R. A. **The Renal Circulation in the Male West African.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, May, v. 48, No. 3, 247–9. [15 refs.]

In 6 Africans from the "local working population" in Lagos, Nigeria, clearances of creatinine and para-amino-hippuric acid were measured. The results were interpreted in terms of glomerular filtration rate and renal plasma flow. Mean values were in agreement with those in European subjects under similar conditions. The author concludes that there was no demonstrable difference in renal circulation between these African subjects and Europeans. The effects of work under hot conditions and of dehydration are being studied. *B. G. Macgraith*

Sardjito. **The Development of Medical Science in Indonesia.** Reprinted from *O.S.R.-News* 2. Gadjah Mada. 1950, Oct., 12 pp. [Numerous refs.]

REPORTS AND SURVEYS

COLONIAL OFFICE. **Colonial Research 1954–1955.** Colonial Medical Research Committee. Tenth Annual Report (1954–1955) [HIMSWORTH, H. P., Chairman] (pp. 91–131). Cmd. 9626. 316 pp. 1955, Nov. London: H.M. Stationery Office. [9s.]

The Colonial Medical Research Committee supervises a wide range of research programmes. At the beginning of the year here reviewed (1954–55) there were 21 established schemes, and to these 6 have been added and 11 others are projected. The Committee's policy of fostering home-based research has been continued, but recognition has been given to the potentialities of Colonial universities as centres of research by the allocation of funds for research at those universities. A number of new appointments were made during the year.

Most of the work reported bears on the major problems of health in the various countries. For instance, there has been intensive study of the transmission and animal hosts of *Loa loa* in Nigeria, of yellow fever virus in Nigeria, Zanzibar and Trinidad, and of *Wuchereria malayi* in Malaya. Important facts have thus been discovered, perhaps the most striking of which are the pathogenicity of *L. loa* for monkeys, and the fact that a parasite apparently identical with *W. malayi* has been found in animals, suggesting a hitherto unsuspected reservoir.

Much of the research has been aimed at direct control of the various diseases. Thus in the Gambia the long-term effects of diethylcarbamazine on filariasis are being assessed, and drug prophylaxis of malaria is being studied; similarly diethylcarbamazine is being used for the control of *L. loa*; in Nigeria one preliminary experiment in malaria control by means of insecticides has given reasonably clear results, and the similar but much more extensive investigation in the north is in progress; in East Africa an extensive scheme for the control and evaluation of malaria in the Taveta-Pare area has been launched.

Some of the work has been aimed at elucidating more fundamental problems. For instance there has been considerable investigation of the body composition of malnourished Africans, and of the intake and output of nitrogen and other essential elements in relation to each other and to total calorie intake. The Hot Climate Physiological Research Unit in Nigeria has continued the series of observations on such subjects as renal function, effect of air movement, and digestibility of local foods.

Perhaps one of the most stimulating discoveries of recent years is the protection afforded by the sickle-cell trait against *P. falciparum* malaria in non-immune persons, with its importance for genetic studies; this work is being encouraged and extended.

At the end of the account of work sponsored by the Colonial Medical Research Committee, a section is included on research undertaken and financed by the medical departments of the different countries. The amount of important work done in this way is considerable; it includes

field trials on malaria suppression in Malaya, a study of food and vitamins in Malaya, the enquiry into the transmission of kala azar in Kenya (where new facts have come to light), and the enquiry into the possibility of eradicating the vectors of filariasis in Fiji.

The brief note on the work of the East African Medical Survey ends on an apprehensive note. In one district bordering Lake Victoria the people have been prosperous of late, but " Prosperity has been a mixed blessing; with the high price of coffee has come cash with which to buy foodstuffs formerly not used, to the neglect of the original staple crop, bananas. Alcoholism and moral laxity have become rife, with a resultant breakdown in married life." This would seem to provide a suitable study for the Colonial Social Sciences Research Council, whose report is printed in the same volume. *Charles Wilcocks*

Bull. Méd. de L'Afrique Occidentale Française. 1955, May, Special No., No. 3, 5–63, 6 pls. (4 coloured folding). [13 refs.] Taches et problèmes de la santé publique en A.O.F. [**Public Health Activities and Problems in French West Africa**] [Sanner, L. & Creste, L.].

This article is a review of the functions and activities of the public health service in French West Africa. With the exception of one chapter dealing with rural public health it is concerned with the regulations governing the service, its operations in large towns, especially Dakar, and an attempt to forecast the direction in which it will evolve, indicating the reforms by which this could be assisted. In colonial territories the main preoccupation of health services until recently has been with vector control and the disposal of human wastes. Their function has altered as a result of preventive campaigns and urbanization and in the large cities, following a change in standards of living, some European diseases have become important. Moreover, in view of the large-scale development schemes being undertaken, certain responsibilities of the health service should be handed over to the sanitary engineer.

In regard to rural hygiene it is pointed out that the main factors producing disease are contaminated water supplies, insect vectors and widespread faecal pollution. The first two can be controlled by the federal or territorial health services, but the last can only be attacked by obtaining the cooperation of the people through health education. Drinking water does not as yet require to be purified; the cost is high and the incidence of water-borne bacterial disease is low in rural areas, but certain simple and cheap measures can be employed to reduce guinea-worm infection and schistosomiasis. Among the subjects discussed in connexion with urban hygiene are defects in notification of infectious disease and the measures taken to remedy these, the Dakar water supply, methods of faeces and rubbish disposal, the control of mosquitoes by anti-adult and anti-larval measures, the effect of residual insecticidal

house-spraying on the flea index, and the control of markets and slaughter-houses.

A chapter is devoted to the future development of urban hygiene in French West Africa. It is pointed out that hygiene, in its strict sense, cannot be dissociated from water supplies, disposal of wastes and road maintenance, and hence in Europe they are all placed together under control of a single authority, the municipality. In the tropics also legislators are demanding a division of responsibility between the municipal authorities which should shoulder the obligations carried by similar bodies in large cities elsewhere, and the health service which should be mainly concerned with measures such as vector control. It is pointed out that much of the legislation governing the health services is now obsolete and does not cover the activities for which the service has had to accept responsibility. A basic need is to revise the statutes.

This paper deals thoroughly with the statutory obligations and organization of the French West African health service, and gives much interesting information about the achievements of the service and the present state of hygiene in French West Africa. It cannot be abstracted satisfactorily.

T. H. Davey

BOOK REVIEW

CHANDLER, Asa C. [M.S., Ph.D.]. **Introduction to Parasitology with special reference to the Parasites of Man.** 9th Edition. pp. xiv + 799, 257 figs. 1955. New York 16: John Wiley & Sons, Inc., 440–4th Avenue. London: Chapman & Hall Ltd., 37, Essex Street, W.C.2. [68s.]

This book, first written in 1918, when it was given the title *Animal Parasites and Human Disease*, was entirely rewritten in 1930 and given the title *Introduction to Human Parasitology*. This title it kept until 1940, when the 6th edition came out and the present title was given to it. Now it achieves, in its 9th edition, another new look [for review of 8th edition see this *Bulletin*, 1950, v. 47, 1237].

The book deals chiefly with the parasites of man, but the references in earlier editions to the parasites of domesticated and other animals have been extended and brought up to date. The whole book has, in fact, been thoroughly revised. As the author says in his preface, " A number of chapters or sections have been entirely or almost entirely rewritten, and changes have been made on every page ".

There have been no important changes in the arrangement of the material, but new and up-to-date classifications have been adopted throughout the book. Medical men will welcome the chapter on the spirochaetes and the references to the bacteria, rickettsiae and filterable

viruses that are transmitted to man by arthropods. "Only enough classification and taxonomy are", the author says, "included to give the student an understanding of the general relationships of the parasites considered." Outlines of the classification of major groups and a number of simple keys to important groups and genera of arthropods have been set in small type, so that they do not interfere with the readability of the text. Throughout the book, in fact, the emphasis is on the biological aspects of the subject, on life histories, epidemiological factors, host-parasite relationships and on the principles on which treatment and control are based. The author warns the medical student that clinical features of the diseases caused are not dealt with in sufficient detail for his needs. The underlying reasons for the effects caused by the parasites are, however, discussed. For details of the methods used for the diagnosis of parasitic infections and for details of treatment, other books will be required.

A feature of this new edition is the great improvement of its illustrations. Most of the new ones have been drawn by Mr. George NEWMAN, of the University of Texas Medical School, and readers will find them a valuable addition to the book. The whole book, in fact, now appears in a more attractive form. References to the literature are given, not in a general list at the end of the book, as many readers would prefer, but at the ends of the chapters. A list of the journals which publish, in various countries, important articles on parasitology is a useful feature. The author explains that references in the text are often given simply as "Smith in 1948 . . ." and that "it should not be too difficult for a student to trace . . . these references , . . through such journals as *Biological Abstracts*, *Helminthological Abstracts*, *Tropical Diseases Bulletin*, *Index Medicus*, *Veterinary Bulletin*, etc.". This will be excellent training for the student, no doubt, but he will often need to be helped and the busy research worker would prefer to have these references precisely specified. The *Index-Catalogue of Medical and Veterinary Zoology*, published by the United States Department of Agriculture, which is so useful for tracing the older references, does not appear in the list of Sources of Information. A long and complete bibliography would, on the other hand, have taken up a good deal of space.

It would have been a pity to have handicapped, by lack of space, this particular author's gift for the graphic and imaginative writing which gives this book a special place in the literature of parasitology. Chandler has always been able, in vivid phraseology, to relate the lives of our parasites to the details of human life all over the world. He has, of course, himself seen them in action in many countries and that experience vivifies his pen. "Substitution of sanitary toilets," he writes, "for the rush-covered floors of the Middle Ages and the shaded soil of unsanitated areas spells extinction for the hookworms and *Ascaris*." Yet one might comment that *Ascaris*, quite uncommon in England, still

occurs occasionally, especially, perhaps, in people who have been holidaying on the continent of Europe. " Domestic animals ", writes Chandler, " soil their tables with their faeces, they eat uncooked food, they drink contaminated waters from ponds and streams, they bathe only by accident, and their hairy bodies provide ideal playgrounds for ectoparasites."

Writing like this brightens up our instruction in matters that are of the first importance to the future of human civilization. Chandler, however, rightly refuses to let us be too complacent about the successes we have had in our wars on the parasites. " The housefly ", he writes, " got a severe setback when the automobile replaced the horse " and " mosquitoes have suffered from agricultural drainage and land reclamation schemes ". Texas fever and *Boophilus annulatus* have been eradicated from the United States; and the great success of campaigns against human malaria in certain parts of the world are encouraging, although this disease remains Public Enemy Number One in many parts of the world. But the battle is still very far from being won. " Houses ", as Chandler points out, " are sprayed to control malaria, but everything else remains the same." The labours of the parasitologists are, in other words, not enough. The modes of life of whole peoples must be changed. We know quite clearly what should be done. We have done it in many places in the world. But so long as a Stoll can estimate that 2,200 million people in the world harbour parasitic worms, a figure that amounts to one infection to every person if the infections were evenly distributed, so long as the World Health Organization can report, as it does in its *Chronicle* for February–March 1955, that every year more than 250 million people have clinical attacks of malaria and some 2½ million die of the disease, we can hardly neglect, as Chandler laments that the United States, at any rate, is now doing, the training of parasitologists in every centre of learning in the world. For control does not only mean the extermination of the parasite. Vigilant watch for a come-back is all the time necessary. Nor is the training of parasitologists alone enough. We must add the instruction in this science of the politicians, the administrators, all the people appointed to order our lives. Most important perhaps of all, we must train the man in the street, or rather the men and women in the paddy fields or along the banks of the irrigation canals; for they, and the habits they inherit and perpetuate, can defeat, as they are doing today, all the knowledge and ingenuity of the trained and devoted men and women who, in every country in the world, are trying to free us from the suffering, death and economic loss that parasitic animals can inflict.

G. Lapage

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